TWENTY-FOURTH ACADEMIC YEAR.

ANNUAL REGISTER

OF THE

UNITED STATES NAVAL ACADEMY

AT

ANNAPOLIS, MD.

OCTOBER 1, 1873.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1873.

THE NAVAL SCHOOL.

FOUNDED OCTOBER 10, 1845.

JAMES K. POLK, *President of the United States.*
GEORGE BANCROFT, *Secretary of the Navy.*

The Naval School was reorganized on the 1st July, 1850, under the title of The Naval Academy, as a school of theoretical and practical science. At that time the course of instruction was materially enlarged, and the institution was placed under the supervision of the Chief of the Bureau of Ordnance and Hydrography.

In October, 1851, the present course of instruction of four years was adopted.

On the establishment of the Bureau of Navigation (July 5, 1862) the Academy was placed under its supervision.

March 1, 1867, it was placed under the direct care and supervision of the Secretary of the Navy, and its departmental administrative routine and financial management conducted through the Bureau of Navigation.

Since March 11, 1869, it has been under the direct care and supervision of the Secretary of the Navy.

March 3d, 1873, the term of the classes was changed by law to six years, instead of four, as previously prescribed, and applies to the class to be admitted this year, and to all subsequent classes.

THE BOARD OF VISITORS FOR JUNE, 1873.

Rear-Admiral CHARLES H. DAVIS, U. S. N., *President.*
Bvt. Maj. Gen. J. J. REYNOLDS, U. S. A.
Honorable ALVAH SABIN, of Vermont.
Professor DAVID A. WALLACE, of Illinois.
Professor G. W. ATHERTON, of New Jersey.
Honorable THOMAS H. DUDLEY, of New Jersey.
WILLIAM H. HACKET, esq., of New Hampshire.
Professor C. G. ROGERS, of Tennessee.
Judge A. A. KNIGHT, of Florida.
Judge D. A. PARDEE, of Louisiana.
Captain GEORGE H. PREBLE, U. S. N.
Chief Engineer CHARLES H. BAKER, U. S. N.

EXTRACT FROM THE REGULATIONS OF THE NAVAL ACADEMY.

CHAP. VI, SEC. 9.—The Secretary of the Navy will, when expedient, annually invite not less than seven persons, such as he may judge well qualified, to attend the Academy during the May examination as a Board of Visitors, for the purpose of witnessing the examination of the graduating and other classes, and of examining into the state of the police, discipline, and the general management of the institution; the result of which examination they will report to the Secretary of the Navy.

OFFICERS OF THE NAVAL ACADEMY.

Rear-Admiral JOHN L. WORDEN,* *Superintendent.*
Commander NORMAN H. FARQUHAR, *Superintendent's Office.*

ACADEMIC STAFF.

Commander K. R. BREESE *	*Commandant of Midshipmen, Head of Department of Seamanship, Gunnery, Naval and Infantry Tactics.*
Commander F. V. McNAIR *	*Assistant to Commandant of Midshipmen, and Senior Instructor in Seamanship, Naval Tactics, and Naval Construction.*
Lieut. Com'r F. J. HIGGINSON	*Assistants to Commandant of Midshipmen, and Assistant Instructors in Seamanship, Naval Tactics, and Naval Construction.*
Lieut. Com'r O. A. BATCHELLER	
Lieut. Com'r P. H. COOPER	
Lieut. Com'r H. C. WHITE	
Naval Const'r THOMAS DAVIDSON, Jr.	*Assistant Instructor in Naval Construction.*
Commander EDWARD TERRY *	*Assistant to Commandant of Midshipmen, and Senior Instructor in Naval Gunnery, Infantry Tactics, and Howitzer Drill.*
Lieut. Com'r G. W. COFFIN	*Assistants to Commandant of Midshipmen, and Assistant Instructors in Naral Gunnery, Infantry Tactics, aad Howitzer Drill.*
Lieut. Com'r A. G. CALDWELL	
Lieut. Com'r B. P. LAMBERTON	
Lieutenant S. A. SIMONS	

MATHEMATICS.

Professor WILLIAM W. HENDRICKSON *	*Head of Department.*
Lieut. Com'r F. E. CHADWICK	*Assistant Instructors in Mathematics.*
Lieut. Com'r S. H. BAKER	
Lieutenant J. E. CRAIG	
Lieutenant W. H. BROWNSON	
Lieutenant ASA WALKER	
Ass't Professor F. H. FOSTER	

STEAM ENGINERY.

Chief Engineer C. H. BAKER *	*Head of Department.*
1st Ass't Eng'r T. W. RAE	*Assistant Instructors in Steam Enginery.*
1st Ass't Eng'r G. E. TOWER	
1st Ass't Eng'r G. W. ROCHE	
1st Ass't Eng'r J. C. KAFER	
1st Ass't Eng'r C. H. MANNING	
2d Ass't Eng'r J. S. OGDEN	

ASTRONOMY, NAVIGATION, AND NAUTICAL SURVEYING.

Lieut. Com'r A. H. McCORMICK *	*Head of Department.*
Lieut. Com'r P. F. HARRINGTON	*Assistant Instructors in Astronomy, Navigation, and Nautical Surveying.*
Lieutenant R. P. RODGERS	

PHYSICS AND CHEMISTRY.

Professor JOHN M. RICE *	*Acting Head of Department.*
Lieut. Com'r C. F. GOODRICH	*Assistant Instructors in Physics and Chemistry.*
1st Ass't Eng'r JOHN PEMBERTON	
Lieutenant M. R S. MACKENZIE	
Professor DAVENPORT FISHER	
Professor NATHANIEL M. TERRY	

ENGLISH STUDIES, HISTORY, AND LAW.

Professor JAMES R. SOLEY *	*Head of Department.*
Lieutenant F. COLLINS	*Assistant Instructors in English Studies, History, and Law.*
Lieutenant C. BELKNAP	
Ass't Professor W. W. FAY	
Ass't Professor C. E. HILL	
Ass't Professor F. SNOW	

MODERN LANGUAGES.

Lieut. Com'r W. S. SCHLEY *	*Head of Department.*
Lieut. Com'r JOHN SCHOALER	*Assistant Instructors in Modern Languages.*
Professor L. F. PRUD'HOMME	
Ass't Professor P. MONTALDO	
Ass't Professor A. V. S. COURCELLE	
Ass't Professor E. DOVILLIERS	
Ass't Professor J. LEROUX	
Ass't Professor H. DALMON	

DRAWING.

Professor RICHARD SOMERS SMITH, A. M. *	*Head of Department.*
Ass't Professor MARSHAL OLIVER	*Assistant Instructors in Drawing.*
Ass't Professor C. F. BLAUVELT	

ART OF DEFENSE.

A. J. CORBESIER	*Sword Master.*
J. B. RETZ	*Assistant Sword Masters.*
GEO. HEINTZ	
MATTHEW STROHM	*Instructor in Boxing, Swimming, and Gymnastics.*

OFFICERS NOT ATTACHED TO THE ACADEMIC STAFF.

Commander SAMUEL DANA GREENE	*In charge of Grounds.*
PHILIP LANSDALE, M. D	*Medical Director, U. S. N.*
GEORGE A. BRIGHT, M. D	*Surgeon, U. S. N.*
LINNARUS FUSSELL, M. D	*Acting Passed Assistant Surgeon, U. S. N.*
THOMAS O. WALTON, M. D	*Acting Assistant Surgeon, U. S. N.*
JAMES D. MURRAY	*Pay Inspector, U. S. N.*
JOHN FUREY	*Paymaster, U. S. N., (Store-keeper,) in charge of Vessels.*
JOHN R. MATTHEWS	*Chaplain, U. S. N.*
THOMAS KARNEY	*Assistant Professor, in charge of Library.*
JAMES J. GRAFF	*Assistant Librarian.*
RICHARD SWANN	*Commissary.*
RICHARD M. CHASE	*Secretary.*
JAMES G. GLYNN	*First Clerk.*
SAMUEL JICKLING	*Second Clerk.*
OWEN D. ROBB	*Third Clerk.*

GUNNERY-SHIP "SANTEE" AND SLOOP "DALE."

Mates—C. J. Murphy, W. G. Smith, L. M. Melcher, and T. W. Bonsall.

AMPHITRITE—(IRON-CLAD.)

Mate—Robert Silver.

PHLOX—(STEAM TENDER.)

Mates—B. G. Perry and Joseph Rodgers.

MARINE GARRISON.

Captain McLANE TILTON, U. S. M. C., *Commanding.*
First Lieutenant E. R. ROBINSON, U. S. M. C.
Second Lieutenant S. H. GIBSON, U. S. M. C.

Those marked thus * are members of the Academic Board.

CADET-MIDSHIPMEN ON PROBATION AT THE NAVAL ACADEMY,

ARRANGED

IN ORDER OF MERIT IN THEIR RESPECTIVE CLASSES

AS DETERMINED AT THE

ANNUAL EXAMINATION IN MAY, 1873;

TOGETHER WITH

THE CADET-MIDSHIPMEN ADMITTED IN JUNE AND SEPTEMBER, 1873,
FORMING THE FOURTH CLASS OF 1873.

NOTE.

Cadet-midshipmen whose names are marked thus (*) are the five most distinguished in their respective classes.

Those marked thus (†) were found deficient, but to continue in their classes on condition of passing at a re-examination.

Those marked thus (‡) were found deficient, and turned back, to re-commence the studies of their respective classes.

Those marked thus (§) were found deficient, and recommended for discharge.

CADET-MIDSHIPMEN ON PROBATION AT THE UNITED STATES NAVAL ACADEMY.

Relative standing of the Graduating Class in the several branches of study.—29 members.

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—										Demerits for the year.	Sea-service.	
				Years.		Seamanship.	Practical exercises in seamanship.	Gunnery.	Fencing.	Steam-enginery.	Navigation and surveying.	Heat and climatology.	Optics and acoustics.	International law.	Spanish.		Months.	Days.
*1	William A. Schuetze	Missouri	June 21, 1869	15	11	1	1	1	2	2	4	4	3	1	1	37	13	8
*2	Charles W. Deering	Maine	June 21, 1869	16	10	6	1	3	14	5	3	1	2	4	1	52	13	8
*3	Gilbert Fowler	Massachusetts	June 23, 1869	15	1	4	12	2	7	8	6	3	4	3	3	103	13	8
*4	Thomas B. Howard	At large	June 24, 1869	14	10	16	17	7	18	1	1	5	5	11	8	0	13	8
*5	Walter C. Cowles	Connecticut	Sept. 21, 1869	16	2	9	9	5	29	3	2	7	6	2	4	106	10	26
6	Austin M. Knight	Florida	June 30, 1869	14	6	3	15	7	28	12	7	6	7	9	22	140	13	8
7	Samuel W. B. Diehl	Pennsylvania	Sept. 20, 1869	18	0	13	16	11	20	11	12	9	8	8	7	28	10	26
8	Charles J. Badger	At large	June 22, 1869	15	10	2	3	4	27	9	21	13	9	12	18	121	13	8
9	A. A. Michelson	....do	June 28, 1869	16	6	25	25	17	4	4	5	2	1	21	5	129	13	8
10	Lucian Young	Kentucky	June 21, 1869	17	2	10	7	10	1	10	11	10	16	22	20	0	13	8
11	R. F. Nicholson	North Carolina	Sept. 30, 1869	16	9	8	6	12	13	16	9	16	11	7	28	134	13	8
12	James P. Underwood	Michigan	June 28, 1869	17	7	17	11	14	7	23	23	18	14	27	13	0	13	8
13	Frank A. Wilner	New York	June 23, 1869	17	10	11	8	16	15	13	8	17	20	15	21	71	13	8
14	Frederick Tyler	Michigan	June 20, 1868	16	1	15	24	6	3	7	18	8	10	5	10	138	13	5
15	Henry Morrell	New York	June 29, 1869	15	10	18	17	27	11	17	13	22	15	28	9	81	13	8
16	Charles F. Putnam	Illinois	June 22, 1869	14	6	19	19	19	17	24	19	20	13	20	10	137	13	8
17	E. B. Underwood	At large	June 24, 1869	16	3	20	20	13	24	26	17	14	22	5	17	105	13	8
18	Augustus L. Case	....do	June 23, 1869	15	5	28	21	19	20	6	22	24	17	23	14	115	13	8
19	William F. Halsey	Louisiana	Sept. 21, 1869	16	5	7	5	15	19	21	14	21	27	13	24	129	10	26
20	Mason A. Shufeldt	Connecticut	June 23, 1869	16	7	24	25	9	12	15	27	12	12	10	26	136	13	8
21	Samuel C. Lemly	North Carolina	June 26, 1869	16	3	21	4	25	24	25	15	11	24	17	19	116	13	8
22	William Winder	New Hampshire	Sept. 16, 1869	18	0	26	29	18	26	14	20	15	19	16	16	138	10	26
23	Thomas E. Muse	Maryland	Sept. 30, 1869	17	0	12	13	26	7	20	25	25	28	19	24	90	10	26
24	J. M. Robinson	At large	June 23, 1869	17	7	22	23	28	10	27	28	29	26	26	12	93	13	8
25	John W. Bean	North Carolina	June 23, 1869	16	0	27	21	21	16	25	24	28	23	25	27	86	13	8
26	Alfred Reynolds	Indiana	Sept. 21, 1869	16	0	14	14	21	5	22	26	27	20	24	6	65	10	26
27	C. B. T. Moore	Illinois	Sept. 27, 1869	16	1	5	9	23	23	18	16	25	29	18	15	103	13	8
28	Z. Matzmulla	Empire of Japan	Dec. 8, 1869	18	1	29	27	29	6	19	29	19	17	Ex.	Ex.	0	7	8
29	T. E. De W. Veeder	New York	Sept. 24, 1869	14	0	23	28	24	22	29	10	23	25	14	22	137	10	9

Relative standing of the First Class in the several branches of study.—33 members.

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—													Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Seamanship.	Practical exercises in seamanship.	Naval tactics.	Ship-building.	Gunnery.	Infantry tactics.	Fencing.	Astronomy.	Magnetism and electricity.	Dynamics.	Statics.	French.	Drawing.		Months.	Days.
*1	George H. Peters	Pennsylvania	June 23, 1870	15	9	4	6	4	5	6	5	5	3	4	1	1	10	8	73	6	26
*2	Albert Wegman	New York	Sept. 21, 1870	16	5	1	1	1	1	1	2	15	1	18	7	5	1	21	47	6	26
*3	Bradley A. Fiske	Ohio	Sept. 22, 1870	16	3	3	22	6	10	13	1	11	2	1	3	3	6	10	132	6	26
*4	Frank H. Holmes	California	June 29, 1870	17	9	8	11	3	8	3	12	14	7	3	4	2	17	1	32	6	26
*5	John W. Stewart	Indiana	Sept. 28, 1870	17	4	2	4	5	4	10	9	20	10	15	10	9	9	4	93	6	26
6	Henry F. Reich	Pennsylvania	Sept. 27, 1870	17	10	11	9	2	14	11	9	7	8	8	5	6	8	3	141	6	26
7	Hamilton Hutchins	New Hampshire	June 23, 1870	15	16	7	12	15	9	5	7	30	9	19	6	7	5	19	108	6	26
8	York Noell	Pennsylvania	Sept. 20, 1870	16	5	22	12	8	20	2	9	17	5	12	2	4	18	2	183	6	26
9	John F. Parker	Ohio	Sept. 29, 1870	17	5	18	17	19	11	4	7	9	14	10	8	11	2	15	148	6	26
10	William E. Whitfield	Arkansas	June 21, 1870	17	11	5	5	18	13	8	15	13	16	20	19	15	3	17	155	10	15
11	W. R. A. Rooney	Pennsylvania	Sept. 28, 1870	16	8	13	26	24	24	17	31	9	6	5	11	10	13	24	128	6	26
12	Matthew G. Reynolds	Missouri	Sept. 21, 1870	15	10	9	10	7	31	18	27	1	11	13	17	13	27	22	75	6	26
13	John C. Colwell	At large	Sept. 22, 1870	14	1	16	6	9	7	11	4	30	12	11	20	18	14	29	169	6	26
14	Winslow Alderdice	Virginia	June 17, 1870	16	2	12	20	17	17	9	3	3	20	26	15	14	19	9	150	6	26
15	John M. Bowyer	Iowa	Sept. 28, 1870	17	3	5	14	10	3	19	14	28	27	28	28	20	15	18	34	6	26
16	Edward J. Dorn	Missouri	Sept. 21, 1870	16	8	17	29	30	21	22	19	27	15	8	25	21	7	14	106	10	15
17	Warner H. Nostrand	New York	Sept. 23, 1870	17	10	15	22	16	27	23	6	26	4	22	18	19	21	30	83	6	26
18	Lyman Arms	Michigan	Sept. 24, 1870	16	10	14	6	11	16	28	17	12	19	16	24	31	20	13	148	6	26
19	George E. Hutter	Virginia	June 21, 1870	17	3	26	17	25	22	21	30	4	22	24	16	16	16	28	60	6	26
20	Bernard O. Scott	Alabama	June 29, 1870	14	5	30	27	14	2	30	17	15	21	23	14	22	32	25	159	6	26
21	Charles W. Haskell	Iowa	June 23, 1870	16	10	24	29	28	26	6	32	21	18	17	22	17	26	27	101	6	26
22	Edwin L. Reynolds	New Jersey	June 21, 1870	17	3	32	29	31	12	14	15	19	23	7	26	25	22	16	79	6	26
23	George T. Emmons	At large	June 4, 1870	17	11	27	1	21	18	29	23	23	25	29	29	30	25	20	70	6	26
†	Frederick W. Danner	Alabama	June 23, 1869	17	7	10	1	13	25	26	29	6	28	25	(d)	26	(d)	31	126	13	14
†	Lucian Flynne	Texas	Sept. 22, 1870	15	10	21	32	20	(d)	14	13	29	12	2	9	(d)	4	23	67	6	26
†	Frank J. Milligan	Tennessee	June 29, 1869	16	6	23	17	27	29	20	26	21	(d)	30	23	29	24	12	121	12	6
†	David Peacock	New Jersey	Sept, 28, 1869	15	4	25	11	29	15	31	22	2	17	6	12	8	(d)	5	116	10	14
†	John O. Nicolson	Alabama	June 29, 1869	16	4	19	22	22	30	23	20	32	26	32	(d)	27	11	11	81	12	6
†	John Farnsworth	Illinois	Sept. 25, 1869	14	0	28	(d)	23	19	32	21	(a)	24	21	26	20	(d)	(d)	122	11	15
†	Edward C. Fuller	Ohio	Sept. 27, 1870	17	11	20	20	12	6	16	28	7	(d)	14	21	12	28	7	172	6	26
§	William N. Conet	Illinois	June 28, 1869	17	5	29	28	26	23	26	25	25	(d)	31	(d)	(d)	33	26	108	9	26
§	Clarence E. Fithian	Ohio	Sept. 22, 1869	17	1	(d)	16	(d)	28	23	23	22	(d)	26	(d)	(d)	(d)	6	63	8	18
§	William A. Northcott	West Virginia	Sept. 24, 1869	15	7	31	22	(d)	32	33	33	17	(d)	33	13	24	29	(d)	196	9	26

(*a*) Absent, sick; not examined.

(*d*) Deficient.

Relative standing of the Second Class in the several branches of study.—45 members.

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—								Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Seamanship.	Gunnery.	Steam.	Mathematics.	Chemistry.	History and rhetoric.	French.	Drawing.		Months.	Days.
*1	Albion C. Hodgson	Georgia	June 5, 1871	17	10	3	5	20	1	3	1	1	33	185	3	18
*2	Frederick W. Coffin	Massachusetts	June 15, 1870	17	9	24	3	26	7	1	3	3	27	213	3	18
*3	Charles H. Amsden	Ohio	Sept. 20, 1871	17	11	4	10	9	4	5	21	7	26	168	3	18
*4	Harry M. Hodges	Illinois	Sept. 29, 1870	15	3	7	10	5	3	4	24	12	7	115	3	18
*5	Walter S. Hughes	Iowa	Sept. 24, 1870	17	11	5	4	19	2	13	18	21	19	153	3	18
6	Nathaniel R. Usher	Indiana	Sept. 21, 1871	16	5	26	15	23	5	14	4	20	8	220	3	18
7	Richard H. Townley	Nebraska	June 20, 1870	17	4	18	12	44	13	8	5	16	10	203	3	18
8	Charles Laird	Ohio	Sept. 28, 1870	16	7	1	21	3	8	6	25	27	11	191	3	18
9	James M. Helm	Tennessee	Sept. 29, 1871	15	9	13	2	41	11	20	18	9	38	213	3	18
10	Cameron M. Winslow	At large	Sept. 27, 1870	16	1	15	7	13	16	20	17	14	5	178	3	18
11	Fydelio S. Carter	Illinois	Sept. 29, 1870	17	4	6	1	20	28	27	7	7	6	95	6	26
12	Clarence A. Corbin	Michigan	Sept. 26, 1870	17	2	39	18	30	6	10	20	5	36	241	6	26
13	William G. Cutler	At large	Sept. 20, 1871	16	11	37	44	28	10	7	11	16	41	85	3	18
14	Charles M. McCartney	Pennsylvania	Sept. 23, 1869	15	1	43	15	26	21	17	1	4	14	169	3	18
15	Augustus E. Jardine	At large	Sept. 21, 1870	15	8	32	24	24	14	26	12	12	29	33	3	18
16	Edward D. Bostick	South Carolina	Sept. 24, 1870	17	1	8	18	35	27	23	6	24	24	125	6	26
17	James S. Manley	Maine	Sept. 29, 1871	17	5	2	8	1	19	24	28	39	16	183	6	26
18	David Daniels	Massachusetts	June 5, 1871	15	4	36	30	39	18	18	8	19	34	88	3	18
19	James T. Smith	North Carolina	June 5, 1871	16	3	42	21	13	23	30	13	6	39	40	3	18
20	John A. Shearman	New York	June 7, 1871	16	10	30	40	11	15	22	16	21	37	225	3	18
21	Allen W. Wills	Pennsylvania	Sept. 21, 1870	17	6	22	42	40	25	40	9	11	13	57	6	26
22	Willie G. Clark	At large	June 28, 1870	16	10	35	32	10	30	9	14	14	25	8	3	18
23	Ridgley Hunt	Louisiana	Sept. 20, 1870	16	7	16	36	16	20	33	22	28	9	225	6	26
24	Alexander Sharp	District of Columbia	June 20, 1870	14	7	12	15	4	25	25	29	34	15	130	6	26
25	Frederick B. Vinton	New York	Sept. 20, 1871	16	9	29	26	37	36	19	10	10	28	108	3	18
26	Frank S. Collins	At large	Sept. 25, 1871	17	2	10	32	32	42	12	14	21	31	164	3	18
27	Moses L. Wood	Missouri	Sept. 21, 1871	17	1	20	13	29	35	2	25	31	12	130	3	18
28	Frank F. Fletcher	Iowa	Sept. 22, 1870	14	10	21	31	38	17	39	36	31	4	119	6	26
29	Frank E. Beatty	Minnesota	Sept. 21, 1871	17	9	41	28	33	12	29	33	25	44	172	3	18
30	William B. Caperton	Tennessee	June 5, 1871	15	11	27	33	22	23	35	41	26	35	0	3	18
31	George H. Worcester	New York	Sept. 26, 1871	14	3	28	9	35	29	28	27	30	40	240	3	18
32	Henry J. Hunt	At large	June 23, 1870	15	2	25	43	15	31	15	37	31	3	230	6	26
33	Robert M. Doyle	Tennessee	Sept. 21, 1870	16	4	31	35	43	24	32	31	38	43	143	6	26

Relative standing of the Second Class in the several branches of study.—45 members—Continued.

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—								Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Seamanship.	Gunnery.	Steam.	Mathematics.	Chemistry.	History and rhetoric.	French.	Drawing.		Months.	Days.
†	Harry H. Hosley	New Hampshire	Sept. 22, 1871	15	10	9	5	18	9	16	(*d*)	2	45	224	3	18
§	William Braunersreuther	Illinois	Sept. 23, 1871	17	7	34	26	30	(*d*)	(*d*)	34	35	32	189	3	18
†	Samuel M. Peacock	Kentucky	Sept. 20, 1871	17	11	23	23	12	(*d*)	(*d*)	39	28	17	116	3	18
§	William A. Glassford	Missouri	Sept. 25, 1871	17	5	11	41	8	(*d*)	31	(*d*)	(*d*)	17	92	3	18
§	William H. Hallowell	Pennsylvania	Oct. 8, 1870	17	8	40	29	17	(*d*)	41	38	(*d*)	42	104	6	26
§	Alfred L. Howe	Pennsylvania	Sept. 28, 1870	16	5	18	25	7	(*d*)	34	23	16	1	132	6	26
§	Simon L. Lanferty	Indiana	Sept. 21, 1871	17	10	(*d*)	45	45	(*d*)	(*d*)	(*d*)	36	22	227	3	18
§	Wilken C. McDowell	Pennsylvania	June 29, 1870	16	8	14	20	34	(*d*)	(*d*)	(*d*)	37	30	134	6	26
§	Horace B. Reed	Indiana	Oct. 5, 1871	17	5	(*d*)	38	5	38	37	(*d*)	(*d*)	2	195	3	18
§	George Stoney	Alabama	Sept. 20, 1870	17	11	17	37	42	34	38	(*d*)	(*d*)	20	196	3	18
§	Hunter C. White	Rhode Island	June 11, 1870	16	5	38	32	2	(*d*)	36	30	(*d*)	23	242	6	26
§	Edgar H. Gaither	Kentucky	Sept. 30, 1870	17	10	33	14	21	32	11	(*d*)	(*d*)	21	135	6	26

(*d*) Deficient.

Relative standing of the Third Class in the several branches of study.—105 members.

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—					Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Mathematics.	Grammar.	History and composition.	French.	Physical geography.		Months.	Days.
*1	Stimson J. Brown	New York	Sept. 16, 1872	17	11	1	4	3	4	4	81	3	18
*2	Charles C. Rogers	Tennessee	June 7, 1872	16	0	2	2	10	4	1	0	3	18
*3	Templin M. Potts	At large	June 6, 1872	16	7	3	1	7	8	2	118	3	18
*4	Henry C. Gearing	Pennsylvania	June 12, 1872	17	3	4	3	9	20	7	163	3	18
*5	Edward M. Katz	Wisconsin	June 8, 1872	16	7	8	8	1	9	2	154	3	18
6	Burns T. Walling	Ohio	June 5, 1872	17	4	5	11	21	14	11	135	3	18
7	Stephen Jenkins	New York	Sept. 20, 1871	14	2	16	5	13	11	5	246	6	6
8	James H. Sears	New York	Sept. 20, 1871	16	8	12	7	17	17	12	251	6	6
9	Charles F. Pond	Connecticut	June 12, 1872	15	7	14	10	8	29	8	107	3	18
10	Robert C. Ray	At large	Oct. 1, 1872	17	11	7	48	20	22	25	53	3	18
11	Clifford J. Boush	Virginia	June 5, 1872	17	9	10	28	26	20	17	25	3	18
12	Thomas G. Winch	Ohio	Sept. 20, 1872	17	10	9	15	11	64	24	90	3	18
13	George C. Foulk	Pennsylvania	June 14, 1872	15	7	15	32	6	33	10	48	3	18
14	Abraham E. Culver	New York	June 5, 1872	16	2	18	18	12	25	8	60	3	18
15	William H. Allen	Illinois	Sept. 26, 1872	15	10	6	22	48	43	30	41	3	18
16	Walter McLean	At large	June 6, 1872	16	10	13	26	5	41	43	31	3	18
17	Henry T. Mayo	Vermont	June 13, 1872	15	6	17	36	4	61	21	188	3	18
18	Daniel R. Case	At large	June 5, 1872	15	0	24	24	19	17	13	236	3	18
19	William L. Varnum	Pennsylvania	June 5, 1871	16	6	11	57	47	42	40	234	6	6
20	L. W. Piepmeyer	At large	Sept. 22, 1871	17	0	26	6	63	9	42	36	6	6
21	John T. Newton	At large	Oct. 14, 1872	17	0	36	16	18	3	15	101	3	18
22	W. I. Chambers	New York	June 5, 1871	15	2	21	33	76	14	52	112	6	6
23	L. K. Reynolds	Alabama	June 5, 1871	14	4	25	42	37	27	13	69	6	6
24	James C. Gilmore	Pennsylvania	Sept. 20, 1871	17	2	22	46	32	40	34	170	6	6
25	Edward R. Poland	Vermont	Sept. 21, 1871	16	6	28	25	22	21	54	266	6	6
26	Henry Minett	Kentucky	June 8, 1872	15	9	23	9	29	48	70	292	3	18
27	Richard Henderson	North Carolina	Sept. 28, 1872	17	1	19	29	54	45	54	208	0	0
28	Francis H. Sherman	Missouri	Sept. 20, 1871	16	5	30	50	23	50	6	159	6	6
29	Hermann F. Grabo	New Jersey	Sept. 22, 1871	16	0	20	67	78	13	73	134	3	18
30	John M. Proudfit	At large	Sept. 24, 1872	17	5	29	27	62	50	28	20	3	18
31	Benjamin Tappan	Arkansas	Sept. 21, 1871	15	5	47	13	14	16	20	160	6	6
32	Anthony W. Rollins	Kentucky	June 10, 1872	17	3	33	30	49	60	25	58	3	18
33	A. C. Macomb	At large	Sept. 24, 1872	17	11	42	17	2	24	55	295	3	18
34	William D. Rose	At large	June 5, 1872	15	11	37	35	16	65	27	123	3	18

Third Class.—105 *members.*—Continued.

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—					Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Mathematics.	Grammar.	History and composition.	French.	Physical geography.		Months.	Days.
35	Richard T. Mulligan	New Jersey	June 5, 1871	15	0	34	81	24	39	31	124	6	6
36	William S. Hogg	At large	Sept. 24, 1872	15	10	31	77	50	37	43	16	3	18
37	Charles A. Gove	New Hampshire	June 5, 1871	16	11	27	40	59	45	66	281	6	6
38	Alfred L. Hall	Ohio	Sept. 16, 1872	17	11	35	19	39	43	58	199	6	6
39	Augustus C. Almy	At large	June 6, 1872	15	6	43	31	66	17	21	77	3	18
40	Cyrus W. Horton	New York	June 12, 1872	16	11	48	12	25	22	47	155	3	18
41	Giro Kunitomo	Empire of Japan	Oct. 7, 1872	17	1	32	71	34	59	67	28	3	18
42	Thomas D. Griffin	Virginia	Sept. 20, 1872	17	9	49	23	35	32	42	30	3	18
43	De Witt Coffmann	Virginia	June 6, 1872	17	6	44	34	38	37	43	17	3	18
44	Henry W. Ford	Georgia	June 5, 1871	17	4	41	41	51	35	38	259	6	6
45	Henry G. Chase	Illinois	Sept. 22, 1871	17	10	38	33	65	35	89	0	6	6
46	N. J. L. P. Halpine	New York	June 9, 1871	14	8	51	44	53	2	37	283	6	6
47	Elstner Fisher	Pennsylvania	Sept. 21, 1872	17	11	39	66	31	83	51	290	3	18
48	Thomas N. Wood	At large	June 6, 1871	16	7	56	14	46	33	46	193	6	6
49	Koroku Katz	Empire of Japan	June 7, 1871	16	4	40	51	73	54	57	199	3	18
50	Edward E. Wise	At large	June 5, 1871	16	6	50	56	41	11	68	184	6	6
51	S. B. Mallory	Virginia	June 12, 1872	16	0	52	37	33	58	63	133	3	18
52	William G. Hannum	Pennsylvania	Sept. 23, 1872	16	1	60	38	38	69	29	226	3	18
53	George D. Donnelly	Arkansas	Sept. 23, 1872	16	6	58	52	15	56	59	252	3	18
54	Edwin C. Goss	South Carolina	Sept. 20, 1871	16	8	45	63	90	66	59	152	3	18
†	Henry A. Johnson	At large	June 5, 1872	17	0	(*d*)	47	58	47	77	148	3	18
†	Thomas B. Maynadier	At large	June 10, 1872	16	9	(*d*)	83	45	31	77	290	3	18
†	Lyman B. Messinger	Massachusetts	Sept. 26, 1872	16	7	(*d*)	73	40	53	49	66	3	18
†	William R. Rush	Louisiana	June 6, 1872	14	8	(*d*)	70	86	71	68	240	3	18
†	James D. Sheeks	Texas	Sept. 24, 1872	15	0	53	61	64	(*d*)	49	291	3	18
†	Selwin E. Woodworth	At large	Sept. 39, 1872	15	5	(*d*)	76	43	7	39	286	3	18
†	Edward D. Leach	Indiana	June 6, 1872	16	9	(*d*)	84	(*d*)	77	86	13	3	18
‡	Jonathan W. Albertson	North Carolina	June 5, 1872	15	3	(*d*)	(*a*)	61	73	(*a*)	21	3	18
‡	Harry W. Dombaugh	Ohio	June 6, 1872	16	4	(*d*)	45	68	(*d*)	81	64	3	18
‡	Takahiko Azuma	Empire of Japan	May 13, 1872	18	0	(*a*)	(*a*)	(*a*)	(*a*)	(*a*)	0	0	0
‡	Joseph B. Gilder	At large	Sept. 27, 1872	14	2	(*a*)	62	(*a*)	56	32	218	3	18
‡	Horace W. Harrison	At large	Sept. 24, 1872	16	9	(*a*)	20	(*a*)	26	21	101	3	18
‡	Fletcher Hodges	Georgia	June 5, 1872	16	8	(*d*)	21	27	48	15	170	3	18
‡	David W. Jones	Ohio	June 8, 1872	16	7	(*a*)	(*d*)	91	62	(*d*)	85	3	18

Alexander R. Mitchell	Maryland	June 6, 1872	15	7	(*a*)	(*d*)	92	94	(*d*)	18	3	18
Calvin C. J. Norris	Illinois	Sept. 26, 1872	14	8	(*d*)	(*a*)	(*d*)	(*d*)	(*a*)	14	3	18
Morton S. Bailey	Pennsylvania	Sept. 20, 1872	17	2	(*d*)	78	70	75	63	264	0	0
William S. Benson	Georgia	Sept. 21, 1872	16	11	(*d*)	(*d*)	83	68	73	60	0	0
Harvey N. Butterfield	Kansas	Sept. 23, 1872	17	6	(*d*)	80	71	(*d*)	19	295	0	0
William Campbell	Ohio	June 5, 1871	16	2	(*d*)	72	56	54	63	158	3	18
John F. Cheek	Indiana	June 6, 1872	16	5	(*d*)	60	72	(*d*)	(*d*)	267	0	0
Caleb V. Cherbonnier	At large	June 6, 1872	15	4	(*d*)	(*d*)	(*d*)	(*d*)	(*d*)	179	0	0
William L. Chipman	At large	June 12, 1872	15	9	(*d*)	(*d*)	(*d*)	(*d*)	(*d*)	*d*394	0	0
James H. Conyers	South Carolina	Sept. 21, 1872	16	10	(*d*)	59	55	(*d*)	81	264	0	0
Albert B. Crittenden	Mississippi	Oct. 3, 1871	16	10	(*d*)	65	57	50	17	201	3	18
Eugene Cruger	New York	June 11, 1872	15	11	(*d*)	(*d*)	(*d*)	1	(*d*)	288	0	0
Francis H. Duer	At large	Sept. 24, 1872	16	4	(*d*)	43	75	6	70	*d*303	0	0
Foxhall P. Eldridge	At large	Sept. 23, 1872	16	3	(*d*)	74	28	27	84	274	0	0
Boyd Ewing	Tennessee	June 8, 1871	14	10	(*d*)	69	89	71	86	197	3	18
Charles P. Fegan	Iowa	Sept. 23, 1872	16	3	(*d*)	(*d*)	69	(*d*)	52	0	0	0
Willis S. Flanigan	Michigan	Sept. 28, 1872	16	10	(*d*)	(*d*)	(*a*)	104	(*d*)	*d*310	0	0
Louis C. Fletcher	Pennsylvania	Sept. 24, 1872	15	4	(*d*)	54	85	(*d*)	77	18	0	0
Arthur B. Frenzel	Massachusetts	June 7, 1872	17	7	(*d*)	87	52	95	34	250	0	0
Frederick D. Gridley	New York	Sept. 24, 1872	17	3	(*d*)	55	81	(*d*)	61	75	0	0
William E. W. Hall	Maryland	June 10, 1872	16	3	(*d*)	64	(*d*)	70	(*d*)	261	3	18
Samuel L. Heap	Georgia	Nov. 4, 1872	15	10	(*d*)	86	84	(*d*)	(*d*)	177	3	18
William C. Henderson	At large	Sept. 24, 1872	17	10	(*d*)	68	42	(*d*)	77	89	0	0
Grosvenor Howard	New York	Sept. 27, 1872	17	8	(*d*)	39	67	(*d*)	32	292	0	0
Horace T. Jones	New York	June 6, 1872	17	8	(*d*)	82	82	(*d*)	26	0	0	0
George E. King	At large	June 5, 1872	15	7	(*d*)	(*d*)	74	(*d*)	(*d*)	54	0	0
William Lockett	Georgia	Sept. 20, 1872	16	1	(*d*)	(*d*)	79	(*d*)	(*d*)	222	0	0
John H. McNasser	Wyoming Territory	June 8, 1872	15	0	(*d*)	85	60	74	75	32	3	18
Charles W. Munn	New York	Sept. 26, 1872	15	5	(*d*)	(*d*)	87	(*d*)	85	151	0	0
John T. O'Keefe	New York	Sept. 24, 1872	15	8	(*d*)	88	30	(*d*)	83	278	0	0
William B. Osterhout	Pennsylvania	June 12, 1872	17	8	(*d*)	49	44	66	62	152	0	0
Benjamin W. Parker	Maine	Sept. 20, 1872	17	0	(*d*)	58	80	(*d*)	70	290	0	0
George H. Reed	Massachusetts	June 5, 1871	17	9	(*d*)	75	77	62	48	133	3	18
Andrew S. Rowan	West Virginia	Sept. 21, 1872	15	4	(*d*)	(*d*)	(*d*)	(*d*)	(*d*)	213	0	0
William F. Ustick	Wisconsin	Sept. 23, 1872	17	5	(*d*)	(*d*)	(*d*)	(*d*)	75	91	0	0
Charles Winston	Alabama	Sept. 20, 1872	17	6	(*d*)	79	88	(*d*)	88	290	0	0
William T. Young	Mississippi	Sept. 20, 1872	15	0	(*d*)	(*d*)	(*d*)	76	(*d*)	232	0	0

(*a*) Absent, sick; not examined.

(*d*) Deficient.

Alphabetical list of Cadet-Midshipmen, ninety-four in number, admitted in June and September, forming the fourth class of 1873–'74.

Name.	State.	Date of admission.	Age at date of admission.	
			Y'rs.	Mo's.
John Ancona	Pennsylvania	Sept. 20, 1873	17	5
Charles N. Atwater	New York	Sept. 24, 1873	16	3
Spencer L. Blodgett	Pennsylvania	Sept. 26, 1873	15	4
Frank M. Bostwick	Wisconsin	Sept. 26, 1873	16	5
Jonathan K. Brice	Ohio	June 13, 1873	17	8
William V. Bronaugh	Kentucky	June 5, 1873	17	9
Thomas M. Brumby	Georgia	Sept. 26, 1873	17	10
Frank S. Buckley	Michigan	Sept. 26, 1873	15	11
Maurice O. Bunn	North Carolina	Sept. 24, 1873	14	10
William L. Burdick	Ohio	Sept. 26, 1873	16	9
William C. Canfield	At large	Sept. 23, 1873	16	1
Austin D Carington	Virginia	Sept. 23, 1873	17	5
Frank B. Case	Michigan	June 7, 1873	15	7
Mark C. Castle	Minnesota	Sept. 29, 1873	16	9
John D. Chase	Georgia	Sept. 29, 1873	15	11
Simon Cook	Missouri	June 6, 1873	16	11
Walter M. Constant	Indiana	June 13, 1873	16	3
Charles R. Crenshaw	Texas	Sept. 30, 1873	17	9
William Crosby	Texas	June 12, 1873	15	7
William G. David	New York	Sept. 25, 1873	17	2
George W. Denfeld	Massachusetts	Sept. 26, 1873	17	1
Baine C. Dent	At large	June 5, 1873	16	7
Thomas Dickinson	Kentucky	Sept. 23, 1873	15	5
Arthur W. Dodd	Indiana	June 6, 1873	16	10
Ornenzo G. Dodge	Kansas	June 13, 1873	17	0
Robert M. Donovan	Oregon	June 13, 1873	17	6
Herbert O. Dunn	Rhode Island	June 6, 1873	16	0
John H. Dykeman	Iowa	June 5, 1873	17	5
William F. Endress	New York	Sept. 25, 1873	17	1
Robert P. Fauntleroy	At large	Sept. 23, 1873	16	5
August F. Fechteler	New York	June 5, 1873	15	0
Lewis C. Fletcher	Pennsylvania	June 14, 1873	16	1
William F. Fullam	New York	Sept. 24, 1873	17	11
Albert Gleaves	Tennessee	June 10, 1873	15	5
Francis S. Goalding	Pennsylvania	June 7, 1873	17	9
Albert W. Grant	Wisconsin	June 9, 1873	17	1
Thomas Green	Texas	June 13, 1873	15	11
William Greer	Kansas	Sept. 20, 1873	16	11
Horace P. Griffith	At large	Sept. 25, 1873	17	5
Walter C. Hagar	Massachusetts	Oct. 3, 1873	15	10
William E. W. Hall	Maryland	June 14, 1873	17	3
Thomas G. Harkness	Pennsylvania	Apr. 21, 1873	17	11
George H. Hess	Michigan	Sept. 23, 1873	17	7
Frank R. Heath	At large	Sept. 23, 1873	16	4
Benjamin W. Hodges	Mississippi	Sept. 23, 1873	17	5
Howard S. Holmes	California	June 5, 1873	17	0
Roscoe Horton	Illinois	Sept. 29, 1873	15	6
Anselm H. Jayne	Mississippi	Sept. 20, 1873	17	0
Alfred Jeffries	Texas	June 9, 1873	17	9
Henry C. Jones	Maine	Sept. 26, 1873	17	1
John N. Jordan	Maine	June 5, 1873	17	8
Philip V. Lansdale	At large	June 6, 1873	15	3
John T. LeBrou	Maryland	June 12, 1873	16	4
Clarence S. Lee	Missouri	Sept. 22, 1873	15	1
Henry B. Lindley	Ohio	June 5, 1873	17	7
John A. Lockwood	Maryland	Sept. 26, 1873	16	10
Richard H. Lull	Illinois	Sept. 23, 1873	16	3
Keizero Machida	Empire of Japan	Oct. 14, 1873	16	4
John G. Mason	Ohio	June 5, 1873	17	6
Alonzo C. McClennan	South Carolina	Sept. 22, 1873	17	4
Frank C. Morris	At large	Sept. 25, 1873	16	6
Valentine S. Nelson	Tennessee	June 6, 1873	17	5
James H. Oliver	Georgia	June 12, 1873	16	0
John M. Orchard	Missouri	June 11, 1873	15	9
George F. Ormsby	Ohio	Sept. 24, 1873	17	4
Russel C. Paris	New York	Sept. 23, 1873	14	1
Benjamin W. Parker	Maine	Sept. 25, 1873	17	0
James P. Parker	North Carolina	June 6, 1873	17	8
John L. Purcell	New Jersey	Sept. 29, 1873	17	4
William C. Riorden	Nevada	Sept. 22, 1873	16	9
Henry H. Rogers	Illinois	June 13, 1873	17	9
Thomas W. Ryan	Pennsylvania	June 13, 1873	16	11
Ezra P. Sanders	California	Sept. 22, 1873	15	3
Oliver J. Schoolcraft	Virginia	June 5, 1873	17	10
William Sencerbox	Minnesota	June 5, 1873	16	7
William K. Stevens	New York	Sept. 29, 1873	16	7

Alphabetical list of Cadet-Midshipmen, &c.—Continued.

Name.	State.	Date of admission.	Age at date of admission.	
			Y'rs.	Mo's.
Bushrod W. Taylor		Sept. 20, 1873	14	7
Hirio Taylor	Illinois	Sept. 29, 1873	17	0
Thomas H. Taylor	Kentucky	Sept. 29, 1873	15	1
Wilson L. Todd	Pennsylvania	June 5, 1873	15	1
Frank W. Toppan	Massachusetts	Sept. 22, 1873	17	9
Arthur B. Tracy	New York	June 5, 1873	16	10
Webster Vinson	At large	Sept. 30, 1873	17	5
Mariam A. Vinton	At large	June 5, 1873	15	11
Harry C. Wakenshaw	New Jersey	June 10, 1873	16	6
Charles H. Walsh	At large	June 18, 1873	16	4
Percival J. Werlich	Wisconsin	June 6, 1873	16	4
Charles S. Williams	Wisconsin	June 12, 1873	16	9
John C. Wilson	New York	Sept. 25, 1873	16	3
Albert G. Winterhalter	Michigan	Sept. 22, 1873	16	11
Horace M. Witzel	Wisconsin	June 5, 1873	15	4
Edward E. Wright	Massachusetts	Sept. 20, 1873	17	0
Robert K. Wright	Pennsylvania	June 10, 1873	14	8
Albert N. Wood	Indiana	Sept. 24, 1873	16	6

SUMMARY.

Academic year 1873–'74, *began October* 1, 1873.

First class of Cadet-Midshipmen	29 members.	
Second class of Cadet-Midshipmen	40 members.	
Third class of Cadet-Midshipmen	56 members.	
Fourth class of Cadet-Midshipmen	116 members.	
		241
First class of Cadet-Engineers	14 members.	
Second class of Cadet-Engineers, (appointments of 1873 and transfers from 1872)	25 members.	
		39
Total		280 students.

Students from the empire of Japan are received for instruction under a resolution of the Senate and House of Representatives of the United States approved July 27, 1868.

CADET-ENGINEERS ON PROBATION AT THE NAVAL ACADEMY,

ARRANGED

IN ORDER OF MERIT IN THEIR RESPECTIVE CLASSES

AS DETERMINED AT THE

ANNUAL EXAMINATION IN MAY, 1873;

TOGETHER WITH

THE CADET-ENGINEERS ADMITTED IN SEPTEMBER, 1873, FORMING THE FOURTH CLASS OF 1873.

Act approved July 4, 1864, authorizes the education of naval constructors, or civil and steam engineers, to be styled cadet-engineers, and limits the number to fifty.

The Academic course of the cadet-engineers comprises two years, and their pay is the same as that of cadet-midshipman.

Act approved March 3, 1873, provides that hereafter the course of instructions for cadet-engineers shall include two years of service in naval sea-steamers in addition to the period at the Naval Academy now provided by law.

NOTE.

Cadet-engineers whose names are marked thus (*) are the five most distinguished in their respective classes.

Those marked thus (†) were found deficient, but to continue in their classes on condition of passing at a re-examination.

Those marked thus (‡) were found deficient, and turned back, to recommence the studies of their respective classes.

Those marked thus (§) were found deficient, and recommended for discharge.

Cadet-Engineers on probation at the Naval Academy. Relative standing of the Graduating Class of 1873.—5 *members.*

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—								Sea-service in practice steamer.	
				Years.	Months.	Steam.	Heat.	Electricity.	Statics.	Dynamics.	Chemistry.	French.	Conduct.	Months.	Days.
1	R. R. Leitch ...	Maryland	Oct. 1, 1871	21	8	2	1	1	1	1	1	1	1	3	6
2	H. T. Cleaver ..	Pennsylvania.	Oct. 1, 1871	19	4	1	2	2	2	3	2	4	4	3	6
3	L. W. Wooster.	New Jersey...	Oct. 1, 1871	19	1	5	3	4	3	2	4	2	3	3	6
4	J. K. Barton ...	Pennsylvania.	Oct. 1, 1871	18	6	3	4	5	4	4	5	3	2	3	6
5	R. G. Denig....	Ohio	Oct. 1, 1871	21	4	4	5	3	5	5	3	5	5	3	6

FIRST CLASS.

25 *members*—1873.

Order of merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—			No. of demerits.	Sea-service in practice steamer.	
				Years.	Months.	Mathematics.	Steam.	French.		Months.	Days.
*1	George B. Ransom......	New York	Oct. 1, 1871	20	3	1	3	4	102	6	2
*2	Abram V. Zane.........	Pennsylvania ...	Oct. 1, 1871	21	1	3	6	7	114	6	2
*3	Asa Mattice	New York	Oct. 1, 1872	19	2	6	4	12	10	2	26
*4	Alfred B. Canaga	Ohio	Oct. 1, 1872	21	9	4	10	9	7	2	26
*5	Benjamin H. Warren ...	Massachusetts ..	Oct. 1, 1871	21	7	9	2	16	0	6	2
6	John R. Edwards.......	Pennsylvania ...	Oct. 1, 1871	18	2	5	13	6	114	6	2
7	William C. Eaton.......	New York	Oct. 1, 1872	21	7	7	12	5	0	2	26
8	Albert B. Willits	Pennsylvania ...	Oct. 1, 1872	21	6	8	8	11	23	2	26
9	William B. Boggs.......	Dist. of Columbia	Oct. 1, 1871	19	11	13	7	3	81	6	2
10	Frank J. Hoffman	Maryland	Oct. 1, 1872	19	11	10	17	2	22	2	26
11	Charles Kleckner.......	Pennsylvania ...	Oct- 1, 1871	18	7	14	9	15	150	6	2
12	Edgar T. Warburton....	Pennsylvania ...	Oct. 1, 1872	17	3	16	16	13	76	2	26
13	Frank H. Eldridge......	Ohio	Oct. 1, 1872	20	2	17	19	17	30	2	26
†	Edmund U. Loomis.....	Maryland	Oct. 1, 1872	21	3	(*d*)	15	(*d*)	19	2	26
†	Stacy Potts	Pennsylvania ...	Oct. 1, 1871	18	7	2	1	(*d*)	94	6	2
‡	George L. Drouillard ...	Ohio	Oct. 1, 1872	20	5	15	18	(*d*)	98	0	0
‡	Charles H. Frizell	Ohio	Oct. 1, 1872	21	7	(*d*)	24	9	0	2	26
§	John N. Cumming......	New Jersey	Oct. 1, 1871	22	0	(*d*)	20	(*d*)	115	3	6
§	Alberto de Ruiz	Pennsylvania ...	Oct. 1, 1872	19	5	(*d*)	14	1	186	0	0
§	William R. King	Maryland	Oct. 1, 1872	19	9	(*d*)	21	(*d*)	90	2	26
§	William N. Little.......	Georgia	Oct. 1, 1872	19	8	(*d*)	11	(*d*)	79	2	26
§	Edward D. Meredith....	Virginia	Oct. 1, 1872	20	3	(*d*)	22	14	197	0	0
§	Leo Morgan	California	Oct. 1, 1872	19	10	(*d*)	5	(*d*)	117	0	0
§	Robert I. Reid	Pennsylvania ...	Oct. 1, 1872	20	2	(*d*)	23	8	71	0	0
§	Edwin C. Sornborger ...	New York	Oct. 1, 1872	20	2	(*d*)	25	(*a*)	38	0	0

(*a*) Absent.　　　(*d*) Deficient.

SECOND CLASS.

Cadet-Engineers arranged in order of merit as determined at their examination for appointments.—18 members.

Order of merit.	Name.	State.	Date of admission.	Age at date of admission.	
				Years.	Months.
1	George S. Willits	Pennsylvania	Oct. 1, 1873	20	6
2	Walter F. Worthington	Maryland	Oct. 1, 1873	18	6
3	Frank H. Bailey	Pennsylvania	Oct. 1, 1873	22	3
4	Benjamin F. Kelley	Maryland	Oct. 1, 1873	20	2
5	William L. Cathcart	Connecticut	Oct. 1, 1873	18	1
6	Alberto de Ruiz	Pennsylvania	Oct. 1, 1873	20	5
7	John W. White	Massachusetts	Oct. 1, 1873	21	8
8	Loring Olmsted	New York	Oct. 1, 1873	18	3
9	George H. T. Babbitt	Ohio	Oct. 1, 1873	17	2
10	Gordon H. Claude	Maryland	Oct. 1, 1873	18	11
11	William Cowles	New York	Oct. 1, 1873	18	7
12	Henry H. Stivers	New York	Oct. 1, 1873	18	0
13	Theodore F. Burgdorff	New Jersey	Oct. 1, 1873	18	9
14	Edward R. Freeman	Mississippi	Oct. 1, 1873	19	9
15	William B. Dunning	New York	Oct. 1, 1873	19	2
16	Thomas F. Carter	Kentucky	Oct. 1, 1873	18	3
17	Charles N. Johnson	Missouri	Oct. 1, 1873	18	2
18	Harry Eastman	District of Columbia	Oct. 1, 1873	20	9

OFFICERS AND CADET-MIDSHIPMEN

ATTACHED TO THE

U. S. PRACTICE-SHIP CONSTELLATION.—SUMMER CRUISE, 1873.

SLOOP "CONSTELLATION."

Commander AUGUSTUS P. COOKE, *Commanding.*
Lieut. Commander O. A. BATCHELLER, *Executive Officer.*
Lieut. Commander GEORGE W. COFFIN, *Navigator.*
Lieut. Commander C. F. GOODRICH, *Senior Watch-Officer.*
Lieut. Commander F. E. CHADWICK, *Instructor in Navigation.*
Lieut. T. A. LYONS, *Watch-Officer.*
Lieut. JOSEPH E. CRAIG, *Watch-Officer.*
Lieut. M. R. S. McKENZIE, *Watch-Officer.*
Surgeon, JAMES H. TINKHAM.
Assistant surgeon, E. Z. DERR.
Paymaster, M. B. CUSHING.
Chaplain, J. R. MATTHEWS.
Second Lieutenant S. H. GIBSON, *U. S. M. C.*
Captain's clerk, C. M. McLEOD.
Paymaster's clerk, JOHN R. ROSS.
Clerk to commandant of midshipmen, J. ORVILLE TAYLOR.
Boatswain, H. DICKINSON.
Gunner, C. C. NEIL.
Sailmaker, T. C. HERBRT.
Carpenter, S. N. WHITEHOUSE.

FIRST CLASS OF CADET-MIDSHIPMEN, (30.)

W. Allderdice.
L. Arms.
J. M. Bowyer.
J. C. Caldwell.
F. W. Danner.
E. J. Dorn.
G. T. Emmons.
J. Farnsworth.
B. A. Fiske.
L. Flynne.
E. C. Fuller.
C. W. Haskell.
F. H. Holmes.
H. Hutchins.
G. E. Hutter.
F. J. Milligan.
J. O. Nicolson.
York Noell.
W. H. Nostrand.
J. F. Parker.
D. Peacock.
G. H. Peters.
H. F. Reich.
E. L. Reynolds.
M. G. Reynolds.
W. R. A. Rooney.
B. O. Scott.
J. W. Stewart.
A. Wegmann.
W. E. Whitfield.

THIRD CLASS, (54.)

W. H. Allen.
A. C. Almy.
C. J. Boush.
S. J. Brown.
D. R. Case.
W. I. Chambers.
H. G. Chase.
De. W. Coffmann.
A. E. Culver.
G. D. Donnelly.
E. Fisher.
H. W. Ford.
H. C. Foulk.
G. C. Gearing.
J. C. Gillmore.
E. C. Goss.
C. A. Gove.
H. F. Grabo.
T. D. Griffin.
A. L. Hall.
N. J. L. T. Halpine.
W. G. Hannum.
R. Henderson.
W. S. Hogg.
C. W. Horton.
S. Jenkins.
H. A. Johnson.
E. M. Katz.
Giro Kunitomo.
A. C. Macomb.
W. McLean.
S. B. Mallory.
H. T. Mayo.
Henry Minett.
R. T. Mulligan.
J. T. Newton.
L. W. Piepmeyer.
E. R. Poland.
C. F. Pond.
T. M. Potts.
J. M. Proudfit.
R. C. Ray.
L. K. Reynolds.
C. C. Rodgers.
A. W. Rollins.
W. D. Rose.
J. H. Sears.
F. H. Sherman.
B. Tappan.
W. L. Varnum.
B. T. Walling.
T. G. Winch,
E. E. Wise.
T. N. Wood.

Fourth Class, (17.)

J. W. Albertson.
H. M. Dombaugh.
J. B. Gilder.
W. E. W. Hall.
H. W. Harrison.
S. L. Heap.
F. Hodges.
D. W. Jones.
E. D. Leach.
J. H. McNasser
T. B. Maynadier.
L. B. Messinger.
A. R. Mitchell.
C. C. J. Norris.
W. R. Rush.
J. D. Sheeks.
S. E. Woodworth.

Total, 101.

Sailed from her anchorage June 12; touched at Hampton Roads leaving the Capes; crossed the Gulf Stream and cruised to the westward of the Bermuda; recrossed the Gulf Stream and cruised north along the coast between Montauk Point and the Capes of the Delaware; touched at Newport; cruised in vicinity, and adjacent waters of Long Island Sound and Gardiner's Bay; from thence sailed for and cruised in the Chesapeake Bay, and arrived in Annapolis Roads 27th September.

U. S. PRACTICE-STEAMER "FORTUNE."

Lieut. Commander A. H. McCORMICK, *Commanding.*
2d Assistant Engineer ROBERT CRAWFORD, *Instructor in Steam Enginery, &c*;
2d Assistant Engineer J. S. OGDEN, *Instructor in Steam Enginery, &c.*
Assistant surgeon, JOHN C. BOYD.
Assistant paymaster, JAMES E. CANN.
Mate, C. J. MURPHY.
Mate, W. G. SMITH.
Mate, L. M. MELCHER.
Mate, L. B. GALLAGHER.
Captain's clerk, W. T. CLAUDE.

First Class of Cadet-Engineers, (14.)

W. B. Boggs.
A. B. Canaga.
W. C. Eaton.
J. R. Edwards.
F. H. Eldridge.
F. J. Hoffman.
C. Kleckner.
A. Mattice.
S. Potts.
G. B. Ransom.
B. H. Warren.
E. T. Warburton.
A. B. Willets.
A. V. Zane.

Second Class, (4.)

C. H. Frizell.
W. R. King.
W. N. Little.
E. W. Loomis.

Sailed from Annapolis Roads July 5; touched at Wilmington, Del., Chester and Philadelphia, Pa., New York City, Cold Spring, and West Point, N. Y., Boston and Charlestown, Mass., returning by Washington, D. C., where the cadet-engineers, in charge of an officer, were allowed to visit and inspect all the iron-founderies, rolling-mills, machine-shops, steam and marine steam engine-works, &c., as well as the several navy-yards, &c., and arrived in Annapolis Roads 27th September.

RESIGNATIONS AND DISMISSALS

FROM

OCTOBER 1, 1872, TO SEPTEMBER 30, 1873, INCLUSIVE.

RESIGNATIONS.

Cadet-Midshipman H. A. Osgood	Oct. 15, 1872.
Cadet-Midshipman W. V. W. Riley	Oct. 17, 1872.
Cadet-Midshipman E. P. Ricker	Oct. 23, 1872.
Cadet-Midshipman L. Flynne	Nov. 5, 1872.
Cadet-Midshipman C. H. Gray	Nov. 6, 1872.
Cadet-Midshipman W. C. Oliver	Nov. 26, 1872.
Cadet-Midshipman H. R. Lewis	Dec. 31, 1872.
Cadet-Midshipman J. E. Anderson	Jan. 2, 1873.
Cadet-Midshipman B. Brown	Feb. 25, 1873.
Cadet-Midshipman A. F. Paff	May 3, 1873.
Cadet-Midshipman W. N. Conet	June 13, 1873.
Cadet-Midshipman C. E. Fithian	June 13, 1873.
Cadet-Midshipman W. A. Northcott	June 10, 1873.
Cadet-Midshipman W. Brannersreuther	June 13, 1873.
Cadet-Midshipman W. A. Glassford	June 13, 1873.
Cadet-Midshipman W. H. Hallowell	June 13, 1873.
Cadet-Midshipman S. L. Lanferty	June 10, 1873.
Cadet-Midshipman W. C. McDowell	June 13, 1873.
Cadet-Midshipman H. B. Reed	June 13, 1873.
Cadet-Midshipman W. B. Alderson	May 17, 1873.
Cadet-Midshipman M. S. Bailey	June 13, 1873.
Cadet-Midshipman W. S. Benson	June 13, 1873.
Cadet-Midshipman William Campbell	June 13, 1873.
Cadet-Midshipman C. V. Cherbonnier	June 13, 1873.
Cadet-Midshipman W. L. Chipman	June 13, 1873.
Cadet-Midshipman A. B. Crittenden	June 13, 1873.
Cadet-Midshipman E. Cruger	June 13, 1873.
Cadet-Midshipman F. P. Eldridge	June 13, 1873.
Cadet-Midshipman C. P. Fegan	June 13, 1873.
Cadet-Midshipman W. S. Flanigan	June 13, 1873.
Cadet-Midshipman A. B. Frenzel	June 13, 1873.
Cadet-Midshipman F. D. Gridley	June 13, 1873.
Cadet-Midshipman W. E. W. Hall	June 10, 1873.
Cadet-Midshipman W. C. Henderson	June 13, 1873.
Cadet-Midshipman G. T. Howard	June 13, 1873.
Cadet-Midshipman H. I. Jones	June 13, 1873.
Cadet-Midshipman G. E. King	June 13, 1873.
Cadet-Midshipman C. W. Munn	June 13, 1873.
Cadet-Midshipman W. B. Osterhout	June 13, 1873.
Cadet-Midshipman B. W. Parker	June 13, 1873.
Cadet-Midshipman G. H. Reed	June 13, 1873.

Cadet-Midshipman W. F. Ustick	June 13, 1873.
Cadet-Midshipman C. Winston	June 13, 1873.
Cadet-Engineer W. E. Schermerhorn	Oct. 21, 1872.
Cadet-Engineer W. E. Schneider	Oct. 21, 1872.
Cadet-Engineer W. C. Jeffrey	Dec. 5, 1872.
Cadet-Engineer J. N. Cumming	June 17, 1873.
Cadet-Engineer E. D. Meredith	June 17, 1873.
Cadet-Engineer Leo Morgan	June 17, 1873.
Cadet-Engineer A de Ruiz	June 17, 1873.
Cadet-Engineer R. I. Reid	June 17, 1873.
Cadet-Engineer E. C. Sornberger	June 17, 1873.

WITHDRAWN.

Cadet-Midshipman William S. McGinnis, appointment withheld	Oct. 15, 1872.
Japanese Student Takahiko Azuma, withdrawn	July 25, 1873.

DISMISSALS.

Cadet-Midshipman R. D. Digges, dismissed	Oct. 21, 1872.
Cadet-Midshipman C. Boult, dropped	Nov. 23, 1872.
Cadet-Midshipman W. S. Flanigan, dropped	Nov. 29, 1872.
Cadet-Midshipman G. W. Collamore, dropped	Dec. 12, 1872.
Cadet-Midshipman G. E. Goodfellow, dropped	Dec. 12, 1872.
Cadet-Midshipman C. Winston, dropped	Feb. 14, 1873.
Cadet-Midshipman H. N. Butterfield, dropped	June 13, 1873.
Cadet-Midshipman J. F. Cheek, dropped	June 13, 1873.
Cadet-Midshipman F. H. Duer, dropped	June 13, 1873.
Cadet-Midshipman B. Ewing, dropped	June 13, 1873.
Cadet-Midshipman L. C. Fletcher, dropped	June 13, 1873.
Cadet-Midshipman W. Lockett, dropped	June 13, 1873.
Cadet-Midshipman J. T. O'Keefe, dropped	June 13, 1873.
Cadet-Midshipman A. S. Rowan, dropped	June 13, 1873.
Cadet-Midshipman W. T. Young, dropped	June 13, 1873.
Cadet-Midshipman R. Henderson, dropped	June 10, 1873.
Cadet-Engineer W. H. Tiffany, dropped	Oct. 24, 1872.
Cadet-Engineer E. Roebling, dropped	Mar. 27, 1873.

CALENDAR—1873-’74.

1873.		
June 5.	—Examination of candidates for admission as cadet-midshipmen began	Thursday.
June 16.	—Examination of candidates concluded	Monday.
July 4.	—Holiday	Friday.
Sept. 15.	—Examination of candidates for admission as cadet-engineers began	Monday.
Sept. 20.	—Examination of candidates for admission as cadet-midshipmen began	Saturday.
Sept. 25.	—Examination of candidates for admission as cadet-engineers concluded	Thursday.
Sept. 30.	—Examination of candidates for admission as cadet-midshipmen concluded	Tuesday.
Oct. 1.	—First term began	Wednesday.
Nov. 27.	—Thanksgiving: studies, recitations, exercises, and duty suspended	Thursday.
Dec. 25.	—Christmas: studies, recitations, exercises, and duty suspended	Thursday.
1874.		
Jan. 1.	—New Year: studies, recitations, exercises, and duty suspended	Thursday.
Jan. 20.	—Semi-annual examination begins	Tuesday.
Jan. 31.	—Semi-annual examination and first term ends	Saturday.
Feb. 2.	—Second term begins	Monday.
Feb. 23.	—Holiday—the day observed instead of 22d	Monday.
May 20.	—Annual examination begins	Wednesday.
June 10.	—Annual examination and second term ends	Wednesday.

PRACTICE CRUISE—1874.

1873–’74.		
June 5.	—Examination of candidates for admission as cadet-midshipmen begins	Friday.
June 15.	—Examination of candidates for admission ends	Monday.
Sept. 15.	—Examination of candidates for admission as cadet-engineers begins	Tuesday.
Sept. 21.	—Examination of candidates for admission as cadet-midshipmen begins	Monday.
Sept. 25.	—Examination of candidates for admission as cadet-engineers ends	Friday.
Sept. 30.	—Examination of candidates for admission as cadet-midshipmen ends	Wednesday
Oct. 1.	—First term begins	Thursday.

REQUISITES FOR ADMISSION

AND

COURSE OF INSTRUCTION,

WITH

EXAMINATION-PAPERS.

COURSE OF INSTRUCTION.

DEPARTMENT OF SEAMANSHIP, NAVAL TACTICS, AND NAVAL CONSTRUCTION.

SEAMANSHIP.—Practically manipulating rope for all useful purposes on shipboard as making knots, splices, bends, hitches, slings, foxes, sennit, gaskets, &c.; passing seizings; worming, parceling, and serving; strapping blocks; the fitting of tackles, and stating the use and power gained in the different purchases; the practical use of the compass, lead, log-line and time-glasses, and helm; the mode of measuring for, the fitting and lead of, all standing and running rigging; getting on board and placing of masts, yards, rigging, sails, anchors, guns, boats, and all other articles of equipment; the storage of ballast, water, provisions, ammunition, sails, cables, and other stores; watching, berthing, and messing the crew; stationing a ship's company for their various duties in working ship; management of boats with sails or oars; passing through a surf, either on landing or coming from a beach; running out hawsers; carrying out anchors; landing guns, troops, &c., under various circumstances; boarding at sea vessels, wrecks, &c.; towing vessels; watering and provisioning ship; midshipmen's duties on the forecastle and quarter-deck, &c., at sea and in port; examination of ship's papers; rules of the road; port routine of exercises with sails and spars, such as furling, bending, loosing, making, shifting, reefing, and unbending sails, and "up and down" top-gallant and royal yards, top-gallant-masts, topsail-yards, lower yards, and topmasts; squaring yards, spreading awnings, &c.; foretelling of wind and weather from appearances of sky; record of weather; barometer, thermometer; preparations for sea; tides; clearing hawse; unmooring ship; weighing anchor; getting under way, under steam and sail, respectively, under various circumstances; drifting or working, backing and filling, and clubbing in a tide-way; warping; making and taking in sails in all kinds of weather; steering; conning; trimming and bracing yards for changes of wind, &c.; tacking; missing stays; wearing; reefing; taken aback; calms; vessels communicating at sea; sounding; heaving to and filling away; chasing; management of vessels and of boats to save men who have fallen overboard, or when struck by a squall; in a gale, scudding, lying to, "broaching to," and "brought by the lee;" parting rigging; masts, yards, or booms sprung or carried away; shifting sails and spars; hurricanes, with nautical directions for avoiding and maneuvering in them; coming to an anchor under sail and steam respectively; mooring ship; heaving down for repairs; getting on shore, leaking, &c.

Text-book.—Luce's Seamanship, with lectures and illustrations from models.

PRACTICAL EXERCISES.—*Seamanship drills* on board the United States ship Dale three times per week, weather permitting, of one and a half hours' duration each. *Exercises with sails,* in bending and unbending, making and taking in sails, reefing, bracing, loosing, and furling. *Exercises on the spars,* in sending up and down topgallant and royal yards, topgallant-masts, topsail-yards, lower yards, and topmasts. *Exercises in naval tactics,* with twelve boats, both under oars and under sails, once a week, weather permitting, of one and a half hours' duration; performing the principal evolutions under steam and under sail, as laid down in the United States Signal Book. *Exercises in Army Signal-Code,* (*Myer.*) Field signal-code by two elements. General-service code.

NAVAL TACTICS.—The different orders of steaming and sailing fleets, divisions, and squadrons, to be observed for battle and for other purposes; mode of forming such orders; of changing from one order to another; of re-forming orders when disturbed by changes of wind; of interchanging and changing the position of different squadrons or divisions forming parts of a fleet; advantages of the different prescribed orders for general or special service; the leading objects to be kept in view in the arrangement of vessels of different strength or force for lines of battle, and in determining upon the manner of making or receiving an attack at sea and at anchor; examinations of the best accounts of fleet-actions; consideration of the advantages or defects of the plans of attack and defense, and of the execution of the details by the commanders of fleets, divisions, squadrons, and vessels; mode of communication by signals, embracing the Naval Code, the Army Code, and the Commercial Code.

Text-books.—Manual of Naval Tactics, (Ward;) Steam-Fleet Tactics, (Parker;) United States Naval Signal-Book, (Naval Tactics;) and Manual of Signals, (Myer.)

SHIP-BUILDING.—Embracing lectures from models and drawings, and examination upon them; building slip; building blocks; keel; rabbet of keel; false keel or shoe; bilge-keels; stem; apron; forward dead-wood; stemson; stern-post; counter-timbers; stern-post-knee; inner post; after dead-wood; after stern-post or rudder-post; stern-framing for a lifting screw; stern-frames of square-sterned ships; transoms; fashion-pieces frames; floors; method of framing; regulating the frame; knight-heads; cants; hawse-pieces; chocks; fillings; keelsons; main-keelson; sister-keelson; boiler or bilge keelsons; capping on main keelson; water-courses; diagonal braces; diagonal bracing on outside of vessels; breast-hooks; stern-hooks; deck-hooks; port-sills; deck-clamps; bilge-strakes; thick strakes; ceiling; outside planking; main wales; channel wales; middle wales; sheer strakes; outside battery plank; garboard strakes; bottom plank; preparations for and method of planking; upon the fastenings of the outside planking; deck-plans; deck-beams; two-piece beam; iron beams; knees used to secure the beams to the ship's side; fastenings of knees; regulating the beams; framing of decks; carlings; framing of mast-partners; ledges; water-ways; deck thick strakes; framing of hatches; spirketing; inside battery plank; deck-stringers; deck-planks; stanchions; fastenings near the binnacle; bitts; bowsprit-bitts; mooring or cable bitts; towing bitts; orlop-deck; bulkheads; poop and topgallant-forecastle-decks; number and names of decks; bulwarks; hammock-nettings; hawse-holes; manger-board and manger; scuppers; air-ports; controllors; compressors; channels; cut-water or head; gripe; caulking; sheathing vessels with copper and yellow metal; mast-steps; capstans; wooden rudders; iron rudders; equipoise or balance rudders; steering-wheels; cat-heads; boats; ventilators; internal arrangement of decks, magazines, and shell-rooms; spaces required for working guns; position of all bolts, bumpkins, chocks, &c., and miscellaneous fittings; docks; wet-docks; dry-docks; method of docking a vessel in a dry-dock; floating sectional dry-dock; marine railway; balance floating-dock; launching; ways; breadth of surface of ways; distance of ways apart; launching-ribband; ribband-shores; back-shores; cradle; bilge-ways; packing or fillings; poppet-ribbands; poppet-lashings; preparations for launching; launching of iron-clad ships built on the longitudinal system; on the completing of launching of ships which have stopped on their launching-ways; launching of the Great Eastern.

DEPARTMENT OF ORDNANCE AND GUNNERY.

PRACTICE AND THEORY OF GUNNERY.—*Practical naval gunnery.*—The nomencla ture of the different parts of ship's guns, and of the carriages which are used in th Navy; and also the several uses and names of all articles belonging to or used with guns and carriages in action; the component parts of gunpowder and the method of manufacture, and the means by which its strength and other qualities are or may be ascertained; the mode of inspecting and of proving guns, shot, and shells, for their reception from the makers; windage; manner of loading, fuzing, and boxing shells, and of unloading them; testing the quality and regulating the length of fuzes; arrangement of ship's magazines, and shell and shot rooms; the dimensions of cartridge-bags, and the mode of making them; weight of charges of powder for different calibers and distances; manner of fitting and using locks and tangent and dispart sights; necessity for guarding powder, shells, fuzes, and all articles of which gunpowder forms a part, from moisture as well as from fire; preparation of a ship for action; stations and duties of men at guns of different calibers, in the different divisions, when preparing for quarters or for action; exercise of the guns, and the duties of those stationed at them in action; modes of ascertaining distances from vessels and other objects at sea; advantages of direct and of ricochet firing under different circumstances; ranges of different projectiles from different calibers and classes of guns; different modes of taking guns on board and sending them from vessels; of mounting and dismounting and transporting them; shifting carriages, breechings, and trucks; securing guns in heavy gales; managing and securing a gun that has broken loose from breeching and tackles; means of gaining greater safe elevation and depression than carriages ordinarily afford; injurious effects of double-shotting upon the recoil and safety of the gun, and upon the projectiles, as to the accuracy of their direction, and the extent of their range for penetration; arrangements for boarding and repelling boarders; different calls and signals used in action; the use of boat and field guns; their nomenclature, weight, calibers, character, and construction, including the carriages with which they are used for boat and shore service; preparation of boats for their use; exercise when used in boats and when on shore; embarking them in boats from vessels; equipment for service against merchantmen, boats, or for shore service; mode of landing and embarking from the shore; construction and preparation, for immediate use, of the shrapnel and other shells, and of grape, and the regulation of the length of fuzes; adaptation of the different kinds of projectiles for service, according to distance, cover, and the character of the objects of attack; returning armament and equipments to the vessel, and disposition to be made of them on so doing. *Theory of gunnery.*—Review of laws of motion, of projectiles *in vacuo* and in the atmosphere; initial, remaining, and final velocities, and the methods of determining their values; the effects of variations of charge, windage, and weight of projectiles; forces of deviation, arising from the motion of rotation and eccentricity of projectiles, from inclination of the axis of the trunnions, and from other causes; examination of the several systems or modes of pointing; tangent sights and determination of their values; penetration and shock of projectiles, when used against earth, wood, or stone, and with direct and ricochet fire; recoil, and how effected by preponderence and position of trunnions in relation to axis of the gun.

INFANTRY TACTICS.—Organization and formation of squad, company, and batallion; facing and wheeling; marching in line and by flank, and filing; manual of small-arms; firing, charging; forming column in mass at half and full distance, and re-forming into line; extension and closing of column; column of route; reducing and increasing front; passage of defiles; advancing and retreating by flank, center, and in line; passage of obstacles; changes of front; forming and reducing square; exercise as skirmishers.

NAVAL ARTILLERY.—School of the piece and school of the battery.

THE ART OF DEFENSE.—Fencing small and broad swords; boxing, swimming, and gymnastics.

DEPARTMENT OF MATHEMATICS.

ALGEBRA.—Fundamental operations; reduction and solution of equations of the first and second degrees; reduction and transformation of surd quantities; proportions and progressions; summation of series; nature and construction of logarithms, and theory of equations.

GEOMETRY.—Plane and solid.

TRIGONOMETRY.—Analytical investigation of trigonometrical formulæ, and their application to the solution of all the cases of plane and spherical trigonometry; the construction and use of trigonometrical tables.

APPLICATION OF ALGEBRA AND TRIGONOMETRY.—Mensuration of planes and solids.

DESCRIPTIVE GEOMETRY.—The graphic illustration and solution of problems in solid geometry, and the applications of this method, particularly to the projections of the sphere.

ANALYTICAL GEOMETRY.—Equations of the right line, plane and conic sections; discussion of general equations of the second degree involving two or three variables; determination of loci; principal problems relating to the cylinder, cone, sphere, and spheroids.

Text-books.—Ray's Higher Algebra; Chauvenet's Geometry; Chauvenet's Trigonometry; Church's Descriptive Geometry; Johnson's Analytical Geometry; Bowditch's Useful Tables.

DEPARTMENT OF STEAM-ENGINERY.

MECHANICAL DRAWING.—Application of right-line drawing and descriptive geometry to the making of drawings of marine steam-machinery after construction.

HEAT.—Application of heat to steam, and the operation and conservation of marine engines and boilers.

STEAM.—Physical properties of water; method of generating steam; boiling-points of fresh and sea water; measure of steam by atmospheres and mercurial column; steam distinguished from other elastic fluids; pressure, density, and temperature of steam; superheated steam; forms of instruments used to determine temperature and pressure of steam.

MARINE BOILERS.—General description of marine boilers; their peculiarities and details of construction; advantages and disadvantages of each type; methods of operating; appurtenances and instruments used in connection with marine boilers to determine their efficiency; means used for their proper care and preservation; economy of fuel, and prevention of smoke.

MARINE ENGINES.—General description of marine steam-engines now in use, condensing and non-condensing; elementary parts of the steam-engine; engines used for marine propulsion in the Navy, advantages and disadvantages of each; detail parts of a marine engine, their use and conservation; different types of paddle-wheels and screw-propellers; comparative efficiency of each for naval purposes; method of hoisting and coupling the screw and paddle-wheel, radial and feathering; duties to steam-machinery when at sea and in port; repairing damages during and after an action; precautions against fire and spontaneous combustion, bad weather, and probability of an engagement; routine duties of the fire and engine rooms when under steam; coal-bunkers and coaling ship; hints regarding selection of coal on foreign stations.

PRACTICAL EXERCISES.—Practical exercises; operating marine engines and boilers under steam; use of indicator and interpretation of its diagrams; practical observation of the methods of adjustment, and means used to insure the safety and preservation of marine machinery.

CHEMISTRY.—The practical application of chemistry to the combustion of fuel; corrosion of the metals; analysis of different kinds of fuel, sea-water, boiler-scale, lubricating-matter, and illuminating-oils.

This branch will be taught by lectures and experiments when marine boilers and engines are under discussion.

DEPARTMENT OF ASTRONOMY, NAVIGATION, AND SURVEYING.

ASTRONOMY.—*Descriptive and physical astronomy.*—Description of the solar system; figure and magnitude of the earth, its motions and consequent changes of seasons; length of day and night; trade and periodical winds; nature and effect of parallax, refraction, dip of the horizon, precession, nutation, and aberration; theory of gravitation; Kepler's laws; explanation of the apparent motions of the sun, moon, planets, and comets, and the principles upon which the determination of their orbits depends; the moon's motions and phases; general theory of the tides; theory of eclipses; general description of the stars, and their distribution in space; measures of time; equation of time. *Practical astronomy.*—The use of astronomical instruments in determining the positions of celestial objects, and terrestrial latitudes and longitudes; optical principles involved in the construction of astronomical instruments, and in the theory of astronomical refraction. Calculation of eclipses and occultations.

NAVIGATION.—Sailing by compass; sailing on a great circle; various methods of finding a ship's place at sea; construction and use of charts, including topographical and hydrographic drawing; principles and use of the sextant and circle of reflection, and application of the glass prism to these instruments; the artificial horizon; the azimuth compass; methods of ascertaining the deviation of the compass, produced by local attraction on shipboard; the log and other instruments for determining a ship's rate of sailing; sounding-instruments; nature and use of the Nautical Almanac; relations of time under different meridians; computation of altitudes and azimuths of celestial objects; finding, by means of amplitudes and azimuths, the variations of the compass; finding the latitude by meridian observations of the sun, moon, planets, and stars; by observations near the meridian, by single altitudes at a given time, and by two altitudes of the same or different objects; finding the longitude by the chronometer by lunar distances, and by altitudes of the moon; Sumner's method of finding a line of position and determining the ship's place by two such lines; rating a chronometer on shore by single altitudes, and by equal altitudes, and finding its error at sea by a series of lunar observations. Theory of the various problems of navigation and nautical astronomy, and the application of spherical trigonometry to their solution. Consideration of the true figure of the earth, and the corrections in nautical problems depending upon it.

SURVEYING.—Its principles and practice; measurement of heights and distances; leveling; trigonometrical surveying; hydrographical surveying; direct measurement of a base-line; measurement by sound; running lines of soundings; reduction for tides; survey of a harbor or river; fixing the position of shoals, &c.; running survey of a coast; geodetic corrections in extended surveys; application of astronomical observations for azimuth, latitude, and longitude.

Text-books.—C. J. White's Astronomy; Jeffers's Marine Surveying; Coffin's Navigation.

DEPARTMENT OF PHYSICS AND CHEMISTRY.

THE DIFFERENTIAL AND INTEGRAL CALCULUS.—The principles of the Differential Calculus, including Taylor's theorem, and applications to problems of maxima and minima, and the tracing of curves; the methods of direct integration, and the application of the integral calculus to areas, surfaces, and volumes, and to the finding of centers of gravity and moments of inertia, and to the simpler cases of differential equations.

MECHANICS.—*Statics*, including the theory of friction, adhesion, and stiffness of cordage. *Dynamics*, including the motion of projectiles *in vacuo*, and in a resisting medium; motions of translation, and of rotation of bodies about an axis; falling bodies; central forces; the simple and the compound pendulum; the ballistic pendulum; the laws of planetary motion; work and conservation of energy.

HYDROSTATICS.—Mechanical properties of fluids; the laws of equilibrium and pressure; the flotation of bodies; the stability and oscillations of floating bodies; specific gravity; the motion of liquids. *Aeriform fluids*: laws of pressure; weight and pressure of the atmosphere; density and temperature; the barometer; the siphon, and the pump.

ACOUSTICS.—Theory of waves; velocity of sound in different media; molecular displacements; interference of waves; reflection and echo; speaking and hearing trumpets; vibrations of strings, of columns of air, and of plates and bells; the communication of vibrations.

OPTICS.—General properties of light; catoptrics; dioptrics; chromatics; vision; optical instruments; physical optics.

ELECTRICITY.—Statical electricity; voltaic electricity; magnetism; electro-magnetism; thermo-electricity.

HEAT.—Conditions of heat; characteristics of heat; theorics of heat, ancient and modern; sources of heat, conduction, radiation, and convection; specific heat; sensible and insensible caloric; effects of heat; instruments used for the measurement of heat; thermo-dynamics.

CHEMISTRY.

METEOROLOGY AND CLIMATOLOGY.

EXPERIMENTAL LECTURES IN PHYSICS AND CHEMISTRY.

Texts-books.—Haddon's Examples of the Differential Calculus, with Lectures; Lectures on the Integral Calculus; Todhunter's Mechanics for Beginners; Besant's Hydrostatics; Ganot's Physics, (Atkinson's translation;) Eliot and Storer's Manual of Chemistry; Eliot and Storer's Chemical Analysis.

DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

ENGLISH GRAMMAR.—Historical development of the English language; relation of English to the other Aryan languages; laws of linguistic growth; changes wrought by foreign influence on the grammar, vocabulary, and pronunciation of English; progress from the synthetic to the analytic forms of speech; character and course of inflexional development. Classification of letters; Grimm's law of the progression of mutes. Etymology; inflectional changes since the Conquest. Syntax; analysis of sentences.—Readings from classical authors, with applications of the principles of grammar, and exercises in analysis, and in tracing the etymological meaning of words.

ENGLISH LESSONS.—Classification of words; definition of words by usage and by derivation; synonyms; abstract terms; force of the common prefixes, affixes, and roots; laws of change in the meaning of words, by contraction, extension, amelioration, &c.—Relation between spoken and written language; faults in diction, and their remedies. Metaphor, as the basis of language. Selection and arrangement.—Elementary principles of reasoning; sources of knowledge; sources of error; induction and deduction; errors in reasoning; fallacies.

Text-books.—Tancock's English Grammar and Reading Book. Seeley and Abbott's English Lessons.

RHETORIC AND COMPOSITION.—Essential properties of style; Campbell's law; classification of sentences; rules for the construction of sentences; figures; punctuation. Exercises in the composition of themes and official reports.

Text-book.—Hart's Rhetoric.

HISTORY.—Origin and ethnological grouping of Aryan, Semitic, and Turanian nations; outlines of history, especially the history of Greece and Rome, of the Holy Roman Empire, and of the states of Western Europe down to 1872; historical geography. Progress of colonial development in America; history of the United States.—Lectures.

Text-books.—Freeman's Outlines of History, with Mitchell's Ancient Atlas and Johnson's Historical Atlas. Eliot's History of the United States, with Appleton's Modern Atlas.

PHYSICAL GEOGRAPHY.—Ansted's Physical Geography, with Atlas.

LAW.—Constitution of the United States.—International law; origin and growth of the science; rights and duties of nations in peace and war; rights of interference, of jurisdiction over the sea, of commerce, of passage over land and navigable rivers; extradition; duties of ministers, consuls, and naval commanders; declarations of war; confiscation of enemy's property and debts; embargoes; kinds of property liable to capture; effect of domicile; privateering; prizes; *jus postliminii;* rights and duties of neutrals; enemy's property in a neutral vessel, and neutral property in an enemy's vessel; law of contraband; law of blockade; right of search; ship's papers; truces, passports, and treaties of peace; offenses against the law of nations; piracy; slave-trade.—Lectures.

Text-book.—Kent's Commentaries, vol. i.

DEPARTMENT OF MODERN LANGUAGES.

Reading and writing the French language correctly; exercises in speaking it.
Reading and writing the Spanish language correctly; exercises in speaking it.

DEPARTMENT OF DRAWING.

Right-line drawing, sketching, and perspective; topographical and chart drawing.

The foregoing studies are distributed over four years, and the cadet-midshipmen are arranged in four classes, each class pursuing the course for the year.

PROGRAMME OF STUDIES FOR CADET-MIDSHIPMEN.

The time devoted to daily recitations is divided into three periods, designated thus: (1), (2), (3). (1) denotes first period, from 8.30 a. m. to 10.30 a. m., except on Mondays, when it is from 9 a. m. to 11 a. m. (2) denotes second period, from 10.45 a. m. to 12.45 p. m., except on Mondays, when it is from 11 a. m. to 12.55 p. m.; and (3) denotes third period, from 2 p. m. to 4 p. m. Practical exercises take place daily after 4 p. m., except on Saturdays, when they commence at 10.45 a. m.

First term: October 1, 1873, *to February* 1, 1874.

Department.	Periods.	Subjects.
Fourth Class—First year.		
Seamanship	[Th.] (3)	Practical Exercises.
Mathematics	[M. T. W. Th. F.] (2) [S.] (1)	Algebra and Geometry.
English Studies, History, and Law	[M. T. W. Th. F.] (1) [T. F.] (3)	Grammar, History, and Composition.
Modern Languages	[M. W.] (3)	Fasquelle's Grammar.
Third Class—Second year.		
Seamanship	[T. F.] (2)	Luce's Seamanship and Practical Exercises.
Gunnery	[M. W.] (2)	Ordnance Instructions and Infantry Tactics.
Mathematics	[M. T. W. Th. F.] (1)	Trigonometry.
Steam-Enginery	[Th.] (3)	Drawing, (Mechanical.)
English Studies, History, and Law	[M. W.] (3) [S.] (1)	History and Composition.
Modern Languages	[T. F.] (3) [Th.] (2)	Fasquelle's Grammar and French Composition.
Second Class—Third year.		
Seamanship	[M. F.] (3) [W.] (1)	Luce's Seamanship [M. and W.] Ship-building [F.]
Gunnery	[F.] (2)	Ordnance Instructions.
Physics and Chemistry	[M. T. Th. F. S.] (1) [T. Th.] (2)	Calculus and Mechanics [M. T. Th. F.] (1.) Magnetism and Electricity [T. Th.] (2) [S.] (1.)
Modern Languages	[M. W.] (2) [Th.] (3)	French Grammar: Le Conscrit and Sadler's Petit Cours.
Drawing	[T. W.] (3)	Sketching.
First Class—Fourth year.		
Gunnery	[M. T. W. Th.] (3)	Ordnance and Armor. Ordnance Instructions and Practical Exercises.
Steam-Enginery	[T. Th.] (2) [S.] (1)	Marine Steam-Engineering and Practical Exercises.
Astronomy, Navigation, and Surveying	[M. T. Th. F.] (1)	Navigation and Nautical Astronomy. Practical Exercises.
Physics and Chemistry	[M. W. F.] (2)	Heat and Climatology.
Modern Languages	[W.] (1) [F.] (3)	Spanish: Ollendorff's Method.

Second term: February 1, 1874, *to June* 1, 1874.

Department.	Periods.	Subjects.
Fourth Class—First year.		
Seamanship	[M.] (3)	Practical Exercises.
Mathematics	[M. T. W. Th. F.] (2) [S.] (1)	Algebra and Geometry.
English Studies, History, and Law	[M. T. W. Th. F.] (1)	English Lessons: History and Composition.
Modern Languages	[T. W. Th. F.] (3)	French Grammar and Exercises.
Third Class—Second year.		
Seamanship	[T. F.] (2)	Luce's Seamanship and Practical Exercises.
Mathematics	[M. T. W. Th. F.] (1)	Analytical Geometry and Descriptive Geometry.
Drawing	[W. F.] (3)	Topography.
Physics and Chemistry	[M. W.] (2) [S.] (1)	Chemistry.
English Studies, History, and Law	[T. Th.] (3)	Rhetoric and Composition.
Modern Languages	[M.] (3) [Th.] (2)	Fasquelle's Grammar and French Composition.
Second Class—Third year.		
Seamanship	[W.] (1) [F.] (3)	Luce's Seamanship [W.] and Naval Tactics, (Ward and Parker,) [F.]
Ordnance and Gunnery	[M. W.] (3)	Gunnery.
Physics and Chemistry	[M. T. Th. F.] (1)	Dynamics and Calculus.
Astronomy, Navigation, and Surveying	[M. W. Th.] (2)	Descriptive and Nautical Astronomy.
Modern Languages	[T. F.] (2) [S.] (1)	Sadler: Nautical Phrase-Book and Grammar.
Drawing	[T. Th.] (3)	Sketching.
First Class—Fourth year.		
Seamanship	[W. Th.] (2) [T.] (3)	Luce's Seamanship.
Steam-Enginery	[M.] (2) [W. S.] (1)	King's Marine Steam-Engine and Practical Exercises.
Astronomy, Navigation, and Surveying	[M. T. Th. F.] (1)	Nautical Astronomy and Surveying. Practical Exercises.
Physics and Chemistry	[T. F.] (2)	Acoustics and Optics.
English Studies, History, and Law	[W. F.] (3)	Constitution of the United States and International Law.
Modern Languages	[M. Th.] (3)	Spanish: Ollendorff's Method.

PROGRAMME OF STUDIES FOR CADET-ENGINEERS.

The time devoted to daily recitations is divided into three periods, indicated thus: (1), (2), (3). (1) denotes first period, from 8.30 a. m. to 10.30 a. m., except on Mondays, when it is from 9 a. m. to 11 a. m.; (2) denotes second period, from 10.45 a. m. to 12.45 p. m., except on Mondays, when it is from 11 a. m. to 12.55 p. m.; (3) denotes third period, from 2 p. m. to 4 p. m. The daily practical exercises of cadet-engineers are the same as those of cadet-midshipmen, except that practical exercises in steam-engineering are substituted for practical exercises in seamanship.

First term: October 1, 1873, *to February* 1, 1874.

Department.	Periods.	Subjects.
Second Class—First year.		
Mathematics	[M. T. W. Th. F.] (1)	Algebra, Geometry, and Trigonometry.
Modern Languages	[T. F.] (2)	French Grammar.
Steam-Enginery	[T. F.] (3) [W. Th.] (2)	Mechanical Drawing.
	[M.] (2) [Th.] (3)	Steam-Engineering.
	[M. W.] (3) [S.] (1)	Practical Instruction.
First Class—Second year.		
Physics and Chemistry	[M. T. Th. F.] (1)	Calculus and Mechanics.
	[M. W.] (2) [Th.] (3)	Heat.
	[W. S.] (1) [Th.] (2)	Chemistry.
Modern Languages	[T. F.] (2)	Fasquelle's French Grammar.
Steam-Enginery	[M. T. W. F.] (3)	Designing and Drawing Machinery, and Practical Instruction.

Second term: February 1, 1874, *to June* 1, 1874.

Department.	Periods.	Subjects.
Second Class—First year.		
Mathematics	[M. T. W. Th. F.] (1)	Trigonometry, Analytical Geometry, Descriptive Geometry.
Modern Languages	[M. W.] (2)	Fasquelle's French Grammar.
Steam Enginery	[M. T. W. Th. F.] (3) [T. Th. F.] (2)	Mechanical Drawing.
	[S.] (1)	Steam-Engineering and Practical Instruction.
First Class—Second year.		
Physics and Chemistry	[M. T. Th. F.] (1)	Calculus and Mechanics.
	[W.] (1) [T. Th.] (2)	Magnetism and Electricity.
	[T. Th.] (3)	Chemistry.
Modern Languages	[M. W.] (2)	Fasquelle's French Grammar.
Steam-Enginery	[M. W. F.] (3) [F.] (2) [S.] (1)	Drawing and Designing Machinery, Steam-Engineering, (Bourne and Rankine,) and Practical Instruction.

LETTER TO CANDIDATES.

NAVY DEPARTMENT,
Washington, January 31, 1863.

Application having been made on your behalf for admission to the United States Naval Academy, you will find in the inclosed permit a statement of the requisite qualifications for admission. Should you, on examination, show a fair proficiency in the branches of knowledge there indicated, and comply with the other conditions, you will be received as a midshipman, and become thenceforward an officer of the Navy of the United States. So great is the importance of this step, not merely to yourself but to the public, that the Secretary deems it a fit occasion to call your attention to the obligations which you assume in this new and honorable character.

You will bear in mind, then, that the Government, in receiving you into its Naval Academy, undertakes to furnish you, at the public expense, with a superior scientific and practical education, under the instruction of thoroughly accomplished teachers. This is a privilege which, in the nature of things, can fall to the lot of but a small portion of the youth of the country, and it is one which, in all probability, many of the pupils of the Academy would otherwise not enjoy. It is, however, but the smallest part of what the Government does for you. In admitting you to the Academy it secures to you an adequate provision, in a most honorable calling, for your future support, of which, while you live, nothing but incapacity or misconduct can deprive you. This great benefit, however, is not conferred on the pupils of the Naval Academy from any favoritism to them, but from great public motives. In the present state of the world the safety and honor of a country require that a portion of the young men should be regularly educated and trained in the science and art of war. This is necessary in both arms of the service, but peculiarly so in the Navy. There are several instances in the land service of brilliant success on the part of chieftains who first entered the field in middle life; but the instances are much less frequent of distinguished naval commanders who did not commence their preparation in youth. This is the important reason for which the country has called the pupils of the Academy from their homes and conferred upon them the above-mentioned enviable privileges.

You must, therefore, bear constantly in mind that these privileges, great as they are, are trusts for which the country will hold you strictly accountable. Henceforward your time is not your own; it belongs to the public. The Government takes you into its service in your youth because your preparation for the active duties of your career cannot be safely delayed to more advanced years. So much scientific, mechanical, and practical knowledge must be acquired, that nothing short of diligent application, commenced in early life, will enable the faithful officer to obtain a thorough mastery of his profession. It is a great error to suppose that nothing is necessary to make a good officer but the physical courage required in time of action, and which is, to some extent, a natural gift. This, of course, is indispensable; but is one only of the qualifications for the service. Beginning at the foundation, the thorough-bred naval officer must know something of ship-building, alike in wood and iron; not that he needs the knowledge of the naval architect, but he must be able to judge of the work both of construction and repair, and be competent to provide a prompt remedy for disasters at sea. He must be intimately acquainted with the rig, equipment, and handling of his vessel; must understand the navigation of the ocean by sails and steam; be familiar with the great currents of the sea and of the atmosphere; and have an accurate knowledge of the principal ports and harbors in every quarter of the globe. He must be thoroughly versed in every variety of naval armament, ordnance, and ammunition—a field of knowledge of which the limits have been greatly enlarged of late years, and in which still further advances are in rapid progress. Thus prepared in the lower branches of his profession, he must, by experience gradually acquired on a small scale, and by diligent study of the lives and exploits of illustrious commanders, learn, so far as it can be learned in this way, not only how single ships are fought, but how great fleets are maneuvered and led to glorious victories.

To attain these great ends, abstract science and mechanical art furnish but the lower instruments. Moral influences must lend their all-powerful aid. Beginning with the arduous task of self-government, of which the habit must be acquired by cheerful conformity to the discipline of the Academy and the subordination of the service, the accomplished officer must learn the great art of governing others over whom he may be placed in the public service. He must learn the lesson of command in the school of obedience. A fractious and intractable pupil, if he succeed in obtaining promotion, will be nearly sure to make an arbitrary and tyrannical officer. Treated, as you will be, with parental kindness at the Academy, nothing that you will learn there is more important than the art of gaining the confidence and winning the affection of those whom you may hereafter command. The officer who acquires the good-will of his men by kind words and deeds will be far more successful in enforcing the necessarily strict discipline of a man-of-war than one who deals in rough language, oaths, and harsh treatment. It is related of a distinguished British naval officer, (Lord Collingwood,) that the most refractory seamen were transferred to his vessel from all the other ships in the fleet, not because his discipline was the most severe, but because it was at once the most gentle and the most efficacious.

The duties thus enumerated, numerous and important as they are, are not all that devolve on the naval officer. In addition to the skill appropriately belonging to his profession, it is necessary that his manners should be marked with courtesy and refinement, and that his mind should be amply stored with useful knowledge. In the service of a great naval power, he will, on foreign stations, often be called upon to appear as the representative of his Government. He will be brought into contact with the naval commanders of other countries, and sometimes with personages of the highest rank and consequence. On these occasions the good name and consideration of his country are, to some extent, in his hands. Still more, he will sometimes be obliged, with little opportunity for deliberation, and no time to consult his Government, to decide important questions of the law of nations. It is evident that the most momentous consequences may flow from the degree of intelligence with which he may act on such occasions.

These are the reasons for which the country calls a select number of her children, in the morning of their days, to enter her naval service. The common parent of all, she bestows upon them these enviable advantages in order to fit them for the various and arduous duties to which I have alluded. The young officer, accordingly, when he enters the Naval Academy, becomes the pledged servant of the country—of the whole country—bound by the strongest ties of duty and gratitude to serve her with fidelity and zeal. He is henceforward an officer, not of the State in which he was born or in which he resides, but of the United States of America. He may have been born at the East or the West, the North or the South, but his allegiance is due to the Union—to the Government which has educated him, which has commissioned him, and which he has solemnly sworn to defend. Wheresoever the voice of duty or lawful authority may call him, there he will cheerfully hasten to sustain the honor of his country's flag, to protect her lawful commerce, to combat her enemies. It may be his duty to risk, perhaps to sacrifice, his life, like the naval heroes who shed undying glory on the American Navy in the last generation, in open war against a legitimate foe; or to follow a piratical sea-rover, meanly fitted out by foreign cupidity for the work of devastation and plunder, or to pass weary days and nights in watching the ports of rebels in arms against their country; or to launch the terrific thunders of his broadsides on their fortresses; whatever the duty may be, it will be diligently, zealously, and heroically performed.

The character of the struggle in which the Government and loyal people of the country have been engaged gives a peculiar significance to these considerations; nor can the Secretary forbear to allude to the all-important services which were rendered by the Navy during that contest. The outbreak of the rebellion found this arm of the service on a peace establishment; its squadrons widely dispersed; some of its most important home stations situated in the seceding States and soon seized—too often with treacherous connivance—and passed into rebel hands. Enfeebled as the Navy was by these causes, and still further by the necessary sacrifice of vessels to prevent them from falling into the hands of the enemy; compelled to call into the service with urgent haste a numerous fleet of vessels not constructed for warlike purposes; above all, obliged, without previous preparation, to inaugurate a novel system of armature—the Navy performed its herculean labors with an energy and success that reflect the highest credit on all belonging to it, officers and men, and which the Secretary takes great pleasure in holding up to the emulation of the young men at the Academy, who will hereafter be called upon to sustain the well-earned reputation of this branch of the service.

Especially let the young men now entering the Navy impress upon their minds, as the great lesson of the day, that of all the duties of a faithful officer, the first and foremost is that of fidelity to his flag—the sacred symbol of the Government which has trained him to its defense and confided its honor to his keeping. Let him, as he sets his foot on the threshold of the Academy, form the firm resolve, living or dying, to be faithful to that great trust. Let him, in advance, steel his mind against the wretched sophistry under the influence of which a portion of the naval officers in the rebellious States, (but by no means all of them,) deceived and misled, against their own better impulses, by the craft of politicians, have allowed themselves to raise a parricidal arm against their country, employing the fruits of the education received at its expense, and of the experience gained in its service, in aid of an unprovoked and cruel rebellion. Before he enters on actual service the young officer takes a solemn oath "to support, protect, and defend the Constitution of the United States against all enemies, whether domestic or foreign;" and the Secretary would earnestly impress upon the young men, on their admission to the Naval Academy, that no human power can absolve them from that obligation. The madness of the hour may cause a misguided man to forget that he has called his God so to deal with him as he shall keep or break his oath, but the time will come, even in this world, when the sin of perjury will lie heavy on his soul.

But the Secretary is confident that no one of the young gentlemen now entering the Naval Academy, or already there, will ever incur the foul reproach of betraying the flag of the Union. They will uphold it on every sea and on every shore, by every effort and at every hazard, in the storm of the elements or the storm of battle. They will live for it and fight for it; if need be, they will bleed for it. While it floats they will stand by it, and, if it must sink, they will go down with it rather than disgrace or betray it.

The Secretary forbears to enter into any particular statements as to the studies, exercises, and discipline of the Academy. The intelligent officer charged with the superintendence of the institution, and who possesses the entire confidence of the Department, aided by his able and efficient associates, will from time to time call your attention to the various details of duty; and the Secretary confidently trusts that under their guidance, you will, by the faithful improvement of your great opportunities, prepare yourself for eminent usefulness and high honor in the service of the country.

GIDEON WELLES,
Secretary of the Navy.

REGULATIONS

GOVERNING

THE ADMISSION OF CANDIDATES INTO THE NAVAL ACADEMY.

I. The number of cadet-midshipmen allowed at the Academy is one for every member and delegate of the House of Representatives, one for the District of Columbia, ten appointed annually at large.

II. The nomination of candidates for admission from the District of Columbia and at large is made by the President. The nomination of a candidate from any Congressional district or Territory is made on the recommendation of the member or delegate from actual resident of his district or Territory.

III. Each year, as soon after the 5th of March as possible, members and delegates will be notified in writing of vacancies that may exist in their districts. If such members or delegates neglect to recommend candidates by the 1st of July in that year the Secretary of the Navy is required by law to fill the vacancies existing in districts actually represented in Congress.

IV. The nomination of candidates is made annually between the 5th of March and the 1st of July. Candidates who are nominated in time to enable them to reach the Academy between the 5th and 15th of June will receive permission to present themselves at that time to the Superintendent of the Naval Academy for examination as to their qualifications for admission. Those who are nominated prior to July 1st, but not in time to attend the June examination, will be examined between the 20th and 30th of September following; and should any candidate fail to report, or be found physically or mentally disqualified for admission in June, the member or delegate from whose district he was nominated will be notified to recommend another candidate, who shall be examined between the 20th and 30th of September following.

V. No candidate will be admitted into the Naval Academy unless he shall have passed a satisfactory examination before the Academic Board, and is found (in the opinion of a medical board, to be composed of the surgeon of the Naval Academy and two other medical officers designated by the Secretary of the Navy) in all respects physically sound, well formed, and of robust constitution, and qualified to endure the arduous labors of an officer in the Navy.

VI. Candidates for appointment as cadet-midshipmen must be between fourteen and eighteen years of age when examined for admission. All candidates for admission will be required to certify *on honor* to their precise age, to the Academic Board, previous to examination, and none will be examined who are over or under the prescribed age. They must be of good moral character, satisfactory testimonials of which, from persons of good repute in the neighborhood of their respective residences, must be presented; and testimonials from clergymen and instructors in colleges and high schools will have special weight. They must also pass a satisfactory examination before the Academic Board in reading, writing, spelling, arithmetic, geography, and English grammer, viz: in *reading* they must read clear and intelligibly from any English narrative work, as, for example, Bancroft's History of the United States; in *writing* and *spelling* they must write from dictation, in a legible hand, and spell with correctness, both orally and in writing; in *arithmetic* they will be examined in numeration and the addition, subtraction, multiplication, and division of whole numbers and vulgar and decimal fractions, and in proportion, or the rule of three, and show a good knowledge of the subject. It is desirable that the board should ascertain the aptitude of a candidate in this branch of study, which, if good, should count in his favor in case of a slight deficiency in other branches. In *geography* candidates will be examined as to the grand divisions, the continents, oceans, and seas, the chief mountains and rivers, and the boundaries and population of the chief nations, their governments, capitals, and chief cities; in *English grammar* they will be examined as to the parts of speech, the rules connected therewith, and the elementary construction of sentences, and will be required to write such original paragraphs as will show that they have a proper knowledge of the subject.

The board will judge whether the proficiency of the candidate in these branches is sufficient to qualify him to enter upon the studies of the Academy.

VII. Any one of the following conditions will be sufficient to reject a candidate:

Feeble constitution; permanently impaired general health; decided cachexia; all chronic diseases, or results of injuries that would permanently impair efficiency, viz:

1. Infectious disorders.
2. Weak or disordered intellect.
3. Unnatural curvature of spine.
4. Epilepsy, or other convulsions, within five years.
5. Impaired vision, or chronic disease of the organs of vision.
6. Great permanent hardness of hearing, or chronic disease of the ears.
7. Loss or decay of teeth to such an extent as to interfere with digestion and impair health.
8. Impediment of speech to such an extent as to impair efficiency in the performance of duty.
9. Decided indications of liability to pulmonary disease.
10. Permanent inefficiency of either of the extremities.
11. Hernia.
12. Incurable sarcocele, hydrocele, fistula, stricture, or hemorrhoids.
13. Large varicose veins of lower limbs. Chronic ulcers.
14. Attention will also be paid to the stature of the candidate; and no one *manifestly* undersized for his age will be received into the Academy. In case of doubt about the physical condition of the candidate, any marked deviation from the usual standard of height will add materially to the consideration for rejection. Five feet will be the minimum height for the candidate.
15. The board will exercise a proper discretion in the application of the above conditions to each case, rejecting no candidate who is likely to be efficient in the service, and admitting no one who is likely to prove physically inefficient. No candidate rejected by the board will be allowed a re-examination.

VIII. If both these examinations result favorably, the candidate will receive an appointment as a midshipman, become an inmate of the Academy, and be allowed his actual and necessary traveling expenses from his residence to the Naval Academy, and be required to sign articles by which he will bind himself to serve in the United States Navy eight years, (including his term of probation at the Naval Academy,) unless sooner discharged. If, on the contrary, he shall not pass both of these examinations, he will receive neither an appointment nor his traveling expenses; nor can he by law have the privilege of another examination for admission to the same class unless recommended by the Academic Board.

IX. When candidates shall have passed the required examinations and been admitted as members of the Academy, they must immediately furnish themselves with the following articles, viz:

One parade-suit	$39 16
One fatigue-suit	13 67
One flannel jacket	13 50
One pea-jacket	23 55
One parade-cap	4 46
One fatigue-cap	1 50
Six white shirts	11 28

Six pair socks	$1 56
Four pairs drawers	3 12
Six handkerchiefs	2 28
One hair mattress	10 71
One straw mattress	1 58
One hair pillow	1 58
One pair blankets	4 25
One spread	1 30
Four sheets	3 52
Four pillow-cases	1 20
Six towels	1 38
Two pair shoes	6 25
One tooth-brush	31
One hair-brush	1 00
One whisk	31
One coarse comb	45
One fine comb	31
One mug	13
One requisition-book	41
One laundry-book	50
One pass-book	50
Total	149 77

Room-mates will jointly procure, for their common use, one looking-glass, two wash-basins, one water-pail, one slop-bucket, and one broom. These articles may be obtained from the store-keeper of the Academy, of good quality, and at fair prices.

X. Each cadet-midshipman must, on admission, deposit with the paymaster the sum of $100, for which he will be credited on the books of that officer, to be expended, by direction of the Superintendent, for the purchase of text-books and other authorized articles besides those enumerated in the preceding article.

XI. A cadet-midshipman found deficient at any examination cannot, by law, be continued at the Academy or in the service, unless upon the recommendation of the Academic Board, and it will be useless to apply to the Secretary of the Navy, who will decline to interfere in the matter.

XII. A cadet-midshipman who voluntarily resigns his appointment within a year of the time of his admission to the Academy will be required to refund the amount paid him for traveling expenses.

GEO. M. ROBESON,
Secretary of the Navy.

ADDENDA.

The foregoing list of prices is published for the information of parents and guardians who are not supposed to know the requirements of the Naval Academy. As these articles are of uniform pattern, it is recommended that they be purchased from the paymaster in charge of stores at the Academy, and a deposit of the amount made at the time of the admission of the candidate. *Underclothes* from home will do.

When candidates are admitted in June they will be at once sent on board ship, and will not be permitted to return again to their homes during that year.

The deposit for clothing, and the entrance deposit of $100 in addition, must be made before the candidate can be received into the Academy.

For the further information of candidates for admission into the Naval Academy, it must be understood that they will be required to pass so thorough an examination in the studies prescribed in Paragraph VI that they shall prove, in that examination, their ability to proceed at once to the higher branches. They will, however, be at all times, during the academic term, subject to examination in the elementary branches.

GEO. M. ROBESON.

A sound body and healthy constitution, good mental abilities, a natural aptitude for study and habits of application, persistent effort, an obedient and orderly disposition, and correct moral principles and deportment, are so necessary to success in pursuing the course at the Academy that persons conscious of any deficiency in these respects are earnestly recommended not to subject themselves or their friends to the mortification and disappointment consequent upon failure, by accepting appointments and attempting to enter a service for which they are not fitted.

SUMMARY OF EXPENSES.

Deposit for clothing	$149 77
Deposit for books, &c	100 00
Total deposit required	249 77

The value of clothing brought from home is to be deducted from this amount.

Each cadet-midshipman, one month after admission, will be credited with the amount of his actual expenses in traveling from his home to the Academy.

GENERAL CHARACTER OF THE QUESTIONS PROPOSED AT THE EXAMINATION OF CANDIDATES FOR ADMISSION TO THE UNITED STATES NAVAL ACADEMY AS CADET-MIDSHIPMEN.

ARITHMETIC.

NOTATION AND NUMERATION.—The candidate is required to express in figures any whole number, decimal, or mixed number, to write in words any given number, and to explain the Roman and Arabic systems of notation.

DENOMINATE NUMBERS.—The tables of money, weights, and measures in common use, including English money; addition, subtraction, multiplication, and division of denominate numbers; the relation existing between the troy and avoirdupois pound; number of cubic inches in a gallon; reduction of differences of longitude to their equivalents in time, and *vice versa.*

FRACTIONS.—The candidate must be familiar with all the processes of common and decimal fractions, and is expected to be able to give clearly the reasons for such processes, and to be familiar with the contracted methods of multiplication and division given in the ordinary text-books on arithmetic.

PROPERTIES OF NUMBERS.—Tests of divisibility of numbers by 2, 3, 5, 8, 9, 11, 25, 125, &c.; the resolution of composite numbers into prime factors; the method of determining whether any number is prime or composite, and of finding the greatest common divisor and the least common multiple of large as well as small numbers.

RATIO AND PROPORTION.—Definitions, and explanations of the nature of ratio and proportion; different methods of writing a proportion; solution of problems in simple and compound proportion.

ANALYSIS.—Miscellaneous problems, usually classed under the head of analysis, or mental arithmetic.

The candidate will be required to perform examples under any or all of the above heads. Questions are to be answered first in writing, and if the written examination is not decisive an oral examination is added.

GEOGRAPHY.

Candidates will be questioned on—

The grand divisions of the land and water; the character of coast-lines; the direction and position of mountain-chains, and the locality of important peaks; the position and course of rivers, their tributaries, and the bodies of water into which they empty; the position of important seas, bays, gulfs, and arms of the sea; the political divisions of the land, their position, boundaries, and capital cities; the position and direction of great peninsulas, and the situation of important and prominent capes; straits, sounds, channels, and the most important canals; great lakes and inland seas; position and political connection of important islands and colonial possessions; locality of cities of historical, political, or commercial importance, (attention is specially called to the rivers and bodies of water on which cities are situated;) the population in round numbers of the great cities of the world of 100,000 or more inhabitants; the course of a vessel in making a voyage between well-known sea-ports.

GRAMMAR.

Candidates will be examined in—

The divisions of grammar, and the subjects treated under each head; the divisions of letters, and the use of capitals; the parts of speech; the classification of *nouns,* and distinctions of person, gender, and number; under *gender*, the three ways of distinguishing sex; under *number*, the rules for the formation of the plural, nouns irregular and defective in number, the plural of proper names; under *case*, the different uses of the three cases, the rules for inflection, the changes in ending to denote case; the difference between the definite and indefinite *article*, and the use of *a* or *an*; the classification of *adjectives*; the explanation of the different degrees of comparison; the rules for comparing adjectives; irregular and defective comparison; numerals and their classification; the double classification of *pronouns*, first, into substantives and adjectives; secondly, into personals, relatives, &c.; peculiarities in the use of personal pronouns, as, the difference between *my* and *mine*, between *thou* and *you*, and the various uses of *it*; compound personal pronouns; the double office of relatives, and the different classes of objects to which each of them is applied; compound relative pronouns; interrogative pronouns; adjective pronouns, or pronominal adjectives, and their classification; the classification and conjugation of *verbs;* the relations between transitive and intransitive verbs; the principal parts of regular, irregular, and defective verbs; the uses and inflection of auxiliaries; the essential peculiarities in the use of voice, mood, tense, number, and person; tense endings and personal endings; impersonal verbs; the classification, formation, and comparison of *adverbs;* conjunctive adverbs; the use of *prepositions*, *interjections*, and *conjunctions*, with the classification of the latter.

Etymological parsing, according to the following model:

NOUN: Class, gender, number, person, case.

ARTICLE: Definite or indefinite; qualified noun.

ADJECTIVE: Class; compared or not compared; comparison, if admitting it; degree of comparison; qualified noun.

PERSONAL PRONOUN: Person, gender, number, case.

RELATIVE PRONOUN: Person, gender, number, case, antecedent.

INTERROGATIVE PRONOUN: Gender, number, case.

ADJECTIVE PRONOUN (or pronominal adjective): Class; qualified word.

VERB: Class, form, principal parts, tense, mood, voice, person, number, subject.

ADVERB: Class; derivation and comparison, if derived and compared; qualified word.

PREPOSITION: Words between which the relation is shown by the preposition.

INTERJECTION: The kind of emotion expressed.

CONJUGATION: Class; words or sentences connected.

READING.

Candidates will be examined in reading aloud Elglish prose, in a standard work; for example, Bancroft's History of the United States.

WRITING AND SPELLING.

Candidates will be required to write a short original letter, and an exercise in dictation, and to spell twenty-four words in common use. An exercise containing less than eight mistakes in spelling will be considered satisfactory in this respect.

The following words were given in June, 1873:

Detriment.
Righteous.
Ignominy.
Embroidery.
Successor.
Spherical.
Consciousness.
Privilege.
Separately.
Commencement.
Judgment.
Differed.
Referred.
Receive.
Believe.
Besiege.
Atrocious.
Sovereign.
Constituents.
Felicity.
Conjecture.
Desperate.
Military.
Resignation.

If the written examination is not decisive, an oral examination is added.

Time allowed for examination in English branches, three hours.

SPECIMENS OF EXAMINATION-PAPERS GIVEN AT THE EXAMINATION FOR ADMISSION TO THE UNITED STATES NAVAL ACADEMY, JUNE, 1873.

EXAMINATION OF CANDIDATES IN ARITHMETIC.

JUNE 6, 1873.—*Time allowed, four hours.*

1. Express in figures the following numbers: Thirteen billions two hundred millions two hundred and eight thousand and one. Eight trillions one million and twenty. Seven hundred and fourteen quadrillions two thousand one hundred and eleven. Two hundred and one *thousandths.* Three hundred and three *trillionths.* Twelve *billionths.* Eighty, and thirteen *ten-thousandths.* Write in words 42004200420042.001875.

2. Reduce $\frac{31}{256000}$ to a decimal. Reduce .0001825 to a common fraction in its lowest terms. Divide .0031442 by 15721. Divide 15721 by .0031442.

3. Separate the following numbers into their prime factors: 273, 169, 676, 1089, 693, and 289. Divide 371868 by 17000.

4. Reduce to its simplest form the expression—

$$\frac{2\frac{1}{6}+5\frac{1}{2}}{3\frac{7}{8}-2\frac{3}{4}} \div \frac{\frac{1}{2}\text{ of }\frac{5}{7}\text{ of }\frac{2}{3}\text{ of }\frac{7}{8}}{\frac{8}{4}\text{ of }\frac{7}{11}\text{ of }\frac{4}{5}\text{ of }\frac{11}{3}}$$

and reduce the result to a decimal.

5. A barrel weighs 38 pounds 12 ounces, and when filled with water weighs 372 pounds; its capacity is 40 gallons, 231 cubic inches to the gallon: find the weight of a cubic foot of water.

6. From a cistern which was three-fourths filled with water, one-twelfth of the contents was lost by evaporation; it was then found that 576 gallons of water remained: find the entire capacity of the cistern in cubic feet.

7. When coal in London is worth £1 7*s*. per ton of 2,240 pounds, what is it worth in United States money, per ton of 2,000 pounds, the pound sterling being worth $4.84?

8. The population of a certain city in 1860 was 356,800, and in 1870 was 396,048: find by what decimal part of itself the population was increased in ten years, and also what the population will be in 1880, provided the same ratio of increase continues.

9. Reduce $\frac{3}{5}$ of $\frac{5}{7}$ of $\frac{11}{17}$ of $\frac{7}{11}$ of $\frac{17}{3}$ of an acre to the decimal of a square mile, and find its cost at 5 cents per square foot.

10. A man deserts from a vessel and travels at the rate of 5 miles per hour; two hours afterwards an officer is sent in pursuit, and travels $6\frac{1}{4}$ miles per hour: how long will it be from the time the officer leaves until the man is caught? Give analysis in full.

EXAMINATION OF CANDIDATES IN GEOGRAPHY.

JUNE 6, 1873.

1. Make a coasting voyage around the Mediterranean Sea, starting from Gibraltar and returning to it again. Name all the bays, straits, seas, and important arms of the sea which you enter, and eight sea-ports which you pass, in order, telling in what country each one is situated.

2. To whom does Vancouver's Island belong? The Canary Islands? New Zealand? The Azores? Malta? Locate each of these.

3. Name three great rivers of Asia, telling in what country they are; where they

rise; in what direction they flow; and into what water they empty. On what river is Paris? Lisbon? Rome?

4. Name, in the order of population, the six largest cities in the United States, and tell which of them, if any, are capitals of States. How many States are there in the United States? Name the Territories.

Name the five great lakes of North America. Where is Lake Maracaybo? Lake Victoria Nyanza? The Dead Sea?

EXAMINATION OF CANDIDATES IN GRAMMAR.

June 6, 1873.

1. What is a compound personal pronoun? Give a list of these pronouns. What classes of pronouns are used as substantives, and what as adjectives?

2. Define *transitive verb*, *irregular verb*, *participle*, *conjugation*. Give all the tense-endings; the person-endings. From what verbs are the following past participles made, respectively: *Laid*, *shed*, *set*?

3. State fully the rule for forming the possessive case of a noun in the plural number. What three ideas does the possessive case connect with the name of an object?

4. Explain the difference between a preposition and a conjunction. What is a conjunctive adverb? Give an example of the last. Compare the abverb *far*.

5. So I have, though it seems you did not observe it. Parse etymologically.

So
I
have
though
it
seems
you
did observe
not
it

N. B.—The principal parts of all irregular verbs are required.

EXAMINATION OF CANDIDATES IN ARITHMETIC.

June 7, 1873.—*Time allowed, four hours.*

1. Express in figures the following numbers: one hundred millions ten thousand and forty-nine; nine hundred quadrillions six hundred thousand four hundred and one; ten quadrillions ten trillions four hundred billions nine thousand and one; two hundred thousand and forty-nine *hundred-millionths;* sixty-seven and one hundred and one *ten-billionths;* one hundred thousand and twenty-nine *ten-billionths;* two hundred and one *ten-trillionths.* Write in words, 30010003001.0000301001.

2. Divide 1001 by 910000; divide 888000 by .0000037; divide .00000101 by 990000; reduce $\frac{911}{20480}$ to a decimal.

3. Simplify the expression—

$$\frac{\frac{2\frac{2}{3}}{3\frac{1}{5}} + \frac{2\frac{1}{7}}{7\frac{1}{2}} + \frac{2}{7}}{5\frac{8}{15} - 4\frac{1}{5}} + 4\frac{3}{11} \text{ of } 2\frac{3}{4} + 1\frac{1}{2}$$

4. A twenty-dollar gold piece weighs 1 oz. 1 dwt. 12 gr.: what amount of money in United States gold coin can a vessel carry whose capacity is 2,500 tons, the avoirdupois pound containing 7,000 grains troy?

5. A hogshead of sherry, which is $\frac{8}{9}$ full, has $15\frac{3}{4}$ gallons drawn off: what is the value of the remainder, the cost of a hogshead being $204.75?

6. Reduce the following expression to a decimal:

$$\frac{.0759}{2\frac{5}{7} - \frac{23}{24}} \div \frac{3\frac{4}{15} - \frac{19}{20}}{14.75}$$

7. Which will be more advantageous to employ on a piece of work, 6 men who work 10 hours a day at 15 shillings per day each, or 9 boys who work 8 hours a day at 9 shillings per day each—a boy being able to do two-thirds as much work as a man in a given time?

8. A and B own respectively $\frac{4}{11}$ and $\frac{2}{9}$ of a schooner worth £355 11*s.* 6*d.*; they exchange their shares: what amount of money ought to pass between them?

9. A man walking a distance of 18 miles finds at the end of 1 hour 48 minutes that the distance he has walked is $\frac{5}{7}$ of the remaining distance: find how many miles he walks per hour.

10. A can complete a piece of work in 12 days, working 8 hours a day; B can do the same work in 7 days, working 9 hours a day: how long will it take both of them to do the work if they work together at it 6 hours a day?

EXAMINATION OF CANDIDATES IN GEOGRAPHY.

JUNE 7, 1873.

1. What oceans, seas, gulfs, and bays indent the coast of Russia? Divide them into groups, according to the parts of the coast which they indent. Where are the Apennines, and in what direction do they extend?

2. Describe the following rivers, telling where they rise, in what direction they flow, into what water they empty: (1) Oder, (2) Humber, (3) Parana, (4) Colorado, (5) Brahma-putra.

3. Give in round numbers the population of Glasgow, Philadelphia, and St. Petersburg, and tell on what river or rivers each is situated. What separates Mexico from the United States? Spain from France? New Hampshire from Vermont? Hindostan from China.

4. Of what state is Washington the capital? Jefferson City? Madison? Monrovia? Jackson? Brussels? Locate the Gulf of Dantzic; Casco Bay; Wabash River.

5. Through what waters would you pass in coasting along from the mouth of the Euphrates to Shang-hai, keeping close in to the shore, and sailing inside of all considerable islands? What three capes would you double?

EXAMINATION OF CANDIDATES IN GRAMMAR.

JUNE 7, 1873.

1. Define *voice, mood, tense.* Name the moods, and state what tenses belong to each. Explain the use of the subjunctive mood. What forms of the subjunctive has the verb "to be," which are wanting in other verbs?

2. Give the general rule for forming the plural of nouns. Give three special rules, exceptions to the first, with examples.

3. Name the relative pronouns, and tell to what class of objects each of them is applied.

4. In what three ways is the objective case used? What change of ending is made in nouns to show a difference in case?

5. "Alas! they had been friends, but they were now separated." Parse etomologically.

EXAMINATION-PAPERS SET AT THE JANUARY AND MAY EXAMINATIONS, 1873.

FOURTH CLASS.

GEOMETRY.

MAY, 1873.—*Time allowed, five hours.*

1. Define *quadrilateral.* Into what classes are quadrilaterals divided? Define each, and give a diagram. Define *conical surface, nappes, geometric locus.* Give three examples of the latter. What is meant by the *plane angle* of a diedral angle?

2. Write formulæ for the following: area of triangle; area of trapezoid; area of circle; circumference of circle; volume of cone, cylinder, and sphere; volume of frustum of cone, and convex surface of cone and cylinder; surface of sphere.

3. In a right triangle a perpendicular is let fall from the vertex of the right angle upon the hypothenuse; state and prove the relation which exists between this perpendicular and the segments of the hypothenuse. The hypothenuse of a right triangle is 26 and one side is 24; find the segment of the hypothenuse adjacent to the side 24.

4. O is the center of a circle and A B and C D are diameters at right angles; the point E is taken on the circumference and O E and B E are drawn; state and prove the relation which exists between the angles A O E and A B E. If a tangent be drawn at E, what is the measure of the angle which it makes with B E? If A O E $= 45°$ and O D $= a$, what is the length of E M, a perpendicular from E on C D?

5. Find to three decimal places the length in miles of an arc of $1° 6' 30''$ of a great circle of the earth, the radius of the earth being 3,962.8 miles.

6. State and prove the theorem from which is derived the formula for the volume of a frustum of a triangular pyramid.

7. O is the center of a circle and A B and C F are diameters at right angles; D is the middle point of O F, and D E $=$ A D is laid off from D toward C. Denoting the radius of the circle by a, find an expression for the length of A E.

8. The sides of a plane triangle are, respectively, 21, 17, and 10; find the length of a perpendicular let fall on the side 21 from the vertex of the opposite angle, and the area of the triangle.

9. A buoy is a combination of a cone cylinder and hemisphere joined base to base; the radius is 3 feet; height of cone, 4 feet; height of cylinder, 2 feet; the material of which it is made weighs 5 pounds to the square foot; find its weight. Supposing it filled with water, what would be its total weight, a cubic foot of water weighing 62.5 pounds?

10. The radius of the base of a right circular cone is 5 and its altitude 12; find, first, at what distance from its vertex a plane parallel to the base must be passed in order to divide it into two equivalent volumes; second, at what distance from the vertex it must be passed so that the *total* surfaces of the two solids shall be equal.

FOURTH CLASS.

ALGEBRA.

MAY, 1873.—*Time allowed, five hours.*

1. Resolve the following expressions into their simplest factors:
$x^2 - a^2$, $x^3 - a^3$, $x^3 + a^3$, $x^4 - 10x^2 + 9$, $x^4 + x^2y^2 + y^4$, $x + \sqrt{xy} + y$, $x^4 + 4a^4$ and $- 4x^2 - 7x + 10$.

2. Simplify the expressions:

$$3a-\Big[x+\Big(2a-(x-c)\Big)\Big]+\tfrac{1}{2}+\frac{2c^2-\frac{1}{2}}{2c+1}$$

And

$$\frac{\dfrac{a^2+c^2}{c}-a}{\dfrac{1}{c}-\dfrac{1}{a}}\div\frac{a^3+c^3}{a^3-c^3}$$

3. Find x, y, z, and u, from the equations—

$$7x+3y=23,$$
$$11z-7u=42,$$
$$4z-7y=7,$$
$$19x-3u=23.$$

4. Solve the equations—

$$\frac{1}{x-1}-\frac{1}{x+3}=\frac{1}{35},$$
$$(a-c)\,x^2-(a+c)\,x+2c=0,$$
$$\frac{\sqrt{4x+20}}{4+\sqrt{x}}=\frac{4-\sqrt{x}}{\sqrt{x}}.$$

5. The sum of the terms of an arithmetrical progression is -520, the common difference -4, and the first term 12; find the number of terms. Find the sum of an infinite number of terms of the geometrical progression of which the first two terms are $2+\sqrt{3}$ and $2-\sqrt{3}$.

6. Find four terms of the development of $\dfrac{a}{\sqrt[3]{a^3-x^3}}$

Separate into partial fractions $\dfrac{5x^2-11x+5}{(x-1)^2\,(x-2)}$ and $\dfrac{x+3}{x^3+1}$.

7. Find one root of the equation $x^3-2x-7=0$ to four decimal places. Find all the roots of the equation $x^5-1=0$.

8. Find L from the formula $L=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$, in which x_1 and x_2, y_1 and y_2 are the values of x and y obtained from the equations $y^2=4\,ax$ and $y=mx+c$.

9. Find the value of the expression—

$$\left\{\sqrt[5]{\frac{a^3\,b\,c^2\,d^{\frac{1}{2}}}{e^3\,f\,g^5}}+.9955668\right\}^{\frac{1}{8}}$$

Given—

$a=10798$ $e=317890$
$b=.00064581$ $f=.00835$
$c=.0087645$ $g=.9995$
$d=.00005381$

10. Find the Naperian logarithm of 157, the base of Naperian logarithms being 2.7183. What is the value of the expression $\dfrac{\log_{10}(\log_{10}a)}{\log_{10}c}$ when $a=2$ and $c=3$? Prove that $\log_a b\,\log_b a=1$.

FOURTH CLASS.

ENGLISH GRAMMAR.

JANUARY.—*Time allowed, five hours.*

1. Name the family of languages to which English belongs, and give the classification of groups in this family, showing what languages are most nearly allied to En-

glish. Explain the change from the *synthetic* to the *analytic* condition of grammar in a language.

2. Explain the term "Norman Conquest," and trace the working of Norman influences down to the XIV century. Give the ordinary laws of change influencing the development of a language.

3. What is a redundant alphabet? A deficient alphabet? Give the reasons why the English alphabet is both, with examples. Name the *guttural mutes.*

4. Define *adjective, verb, root, inflexion.* Name and describe the three kinds of inflexion. Explain the formation of any four of the following words: *Spinster, oxen, elder, fritter, blacken, shipwreck, mishap.*

5. Give a comparative table of the inflexions of the noun *field* (O. E. *feld*) in the eleventh century, the fourteenth century, and in modern English. Explain the difference in respect to gender between old English and modern English.

6. Give the eleventh century and the fourteenth century inflexions of the adjective *góda* (*good*) through the singular. What inflexional variations does the same word have in modern English? Compare *dry, gay, shy, fore, nigh.*

7. Explain the difference in use between *my* and *mine.* Explain the difference in meaning between *each, every,* and *either.*

8. How may intransitive verbs be made transitive? Give examples. Classify the nine tenses, and tell which of them have inflected tense-forms.

9. Give the participles of the verb *to love* in the three stages of English inflexion. Explain the difference between *shall* and *will*, giving illustrations. Inflect any verb of the strong conjugation throughout the inflected tense and mood forms.

10. Give a complete analysis of the following passage, and explain etymologically and syntactically the words in italics:

> "The *younger* heads were *busy* with the tale
> Of that great chief *whose* exploits helped the Moor;
> And, *talking* still, they shouldered *past* their friends,
> Following some lure which *held* their *distant* gaze
> To *eastward* of the quay, where yet remained
> A low black tent, *close guarded* all around."
> [George Eliot, *The Spanish Gipsy.*

FOURTH CLASS.

OUTLINES OF HISTORY.

January.—*Time allowed, four hours.*

1. Give a tabular classification of the branches of the Aryan, Semitic, and Turanian families of nations. What were the peculiar features of Aryan government? Of the great Semitic religions?

2. Describe the four forms of government common in ancient Greece. Compare Homer, Herodotus, Thucydides in regard to their credibility as historians. The Peloponnesian war: causes, sides, leading events, dates, immediate results. How could the overthrow of the Persian Empire be called a Greek conquest? What was the nature of the conquest?

3. Three Punic wars: dates, and principal name in each war. What was the character of the Roman constitution, both nominally and really, in the latter half of the second century B. C.? What were the parties in the state? What cause was taken up by Ti. Gracchus? What by C. Gracchus? What change was made in Roman citizenship under Caracalla? Trace the growth of Christianity to the time of Constantine.

4. Name the Romance languages, and give an account of their origin. Give the main facts connected with the English conquest of Britain. State the changes in the

political condition of Italy between 476 A. D. and 800 A. D. Bound the Empire of Charles the Great.

5. Name the Saxon Emperors. Explain the expressions *feudal tenure*, *serf*, *allodial holding*, *secular clergy*. What were the two customs which gave rise to the feudal system? State the origin of the contest between the Guelfs and Ghibelins, and the parties represented by these names.

6. Show how Charles V came into possession of his different dominions. (Make a genealogical table.) Give the date of the peace of Westphalia, and state the changes political and geographical, which it legalized.

*7. Give all the changes in form of government and dynasty which took place in England between 1640 and 1720, with the date of each change, and a brief explanation of its causes.

*8. Give a similar account in regard to France between 1792 and 1872.

9. Give an event corresponding to each of the following dates: 451, 711, 987, 1099, 1520, 1713, 1827.

10. State some important historical fact connected with each of the following names: Justinian, Egbert, Gustavus Adolphus, Cavour. Locate Lorraine and Provence, and explain the origin of the names.

FOURTH CLASS.

ENGLISH.

MAY.—*Time allowed, five hours.*

1. Show how the method of induction is applied to the discovery of the meanings of words. Illustrate by the word *oppression*. Why are synonyms more common in English than in other languages? What is *generalizing?* What is an *abstract term?* Explain the origin of these names.

2. What are *hybrids?* Mention *hybrids* that are recognized as good English. Mention the different classifications of the consonants. What is *Grimm's law?* Give instances. Show that the law of contraction of meaning is natural in a civilized nation.

3. Show that impassioned prose may approximate to the (*a*) metre, (*b*) brevity of poetry. In what point does the best prose of this kind keep itself distinct from poetry, What is the best broad rule for writing English prose? What is the fault of *fine writing?* Whence does it arise?

4. Why must we bestow more pains on the arrangement of words in writing than in conversation? How has King James's version of the Bible influenced our choice of words?

5. What is personification? Give instances. Show that personification can be analyzed.

6. How do scientific and unscientific composition differ from each other? What is meant by the unity of feeling in an imaginative work? Give instances of the violation of it. How may a play be neither a tragedy nor a comedy?

7. What is induction? What was the original meaning of the word? Why is experiment necessary to induction? What is meant by *logical predicate, middle term, minor premise, syllogism, copula, deduction?*

8. What are "the five fallacies"?

Men are rational animals.
Thomas acts irrationally.
Therefore Thomas is not a man.
Discuss this.
What is meant by *reasoning in a circle?* Give an instance.

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*Alternatives.

FOURTH CLASS.

HISTORY OF THE UNITED STATES.

MAY.—*Time allowed, five hours.*

1. Tell by what nations the thirteen colonies were planted, respectively. Mention the chief facts connected with the settlement under the London Company. The settlement of Rhode Island.

2. Mention the principal successes on each side in the Seven Years' War, (colonial.) Give the name and date of the treaty at its close, and state briefly its effects on the colonies. The United Colonies of New England.

3. Name and describe six of the obnoxious acts of Parliament passed between 1764 and 1774. The Declaration of Rights and Liberties; the American Association. Give the main features of each.

4. Who constituted the committee appointed to prepare the Declaration of Independence? When were the Articles of Confederation adopted by Congress? When did they go into operation? When did they become inoperative? State the leading defects in the Articles of Confederation.

5. State the various transfers undergone by Louisiana and Florida between 1760 and 1820, with dates, and the conditions of the final transfer in each case. Causes of the War of 1812; name and date of the treaty which ended the war.

6. (*a*) The Missouri Compromise. (*b*) The Monroe Doctrine. (*c*) The Compromise o 1850. Give the principal features of each.

7. Mention some leading event or events in the career of each of the following Ponce de Leon, La Salle, J. P. Jones, Gates, Porter, Stewart, Jay, Decatur.

8. Fix the situation of the following places, and mention in each case the event which gives them historical importance: Quebec, Louisburg, Plattsburg, Vera Cruz, Bennington, North Point. Treaty of Paris, 1783; treaty of Washington, 1842; treaty of Guadalupe Hidalgo, 1848: name the commissioners on the part of the United States and the leading stipulations in each case.

FOURTH CLASS.

FRENCH.

MAY, 1873.

Translate into French—

Have you the wheat?
You have the wheat and the flour.
Has the tailor cloth?
The tailor has a piece of cloth.
Are you sleepy, sir?
No, sir; I am not sleepy, but I am hungry.
Have you my knife or my fork?
I have neither your knife nor your fork.
Has the tinman my silver candlestick, or yours?
He has neither your silver candlestick nor mine.
Have you my beautiful leather slippers?
No, sir; I have your old velvet ones.
Are you more attentive than your sister?
I am not so attentive as your brother.
How old is your brother-in-law?
He is fifty years old.

Are your clothes at the painter's?
They are not there; they are at my house.
Will you send us that letter?
I will send it to you if you will read it.
Write the primitive tenses of *Dire* and *Se Flatter*.

ORAL EXAMINATIONS.

Exercises at blackboard in writing phrases, in answer to questions in French; principal rules with the grammatical relation of words in sentences, as far as page 40 of Fasquelle's Grammar; French conversations; different tenses of several French verbs, with explanation of tenses, formation, and use.

THIRD CLASS.

SEAMANSHIP.

ORAL EXAMINATION—SPECIMEN QUESTIONS.

MAY, 1873.

I.

1. How is a round seizing passed? State its use.
2. Describe manila rope. State its use.
3. Rig a flying-jib-boom.
4. Ship in the stream; make preparations for getting shears on board.
5. Reeve lower studding-sail outhaul.
6. Make up a course for bending.
7. Ship running before the wind, wind N. NE., how will a vessel bear, seen 2¼ points abaft the port beam?

II.

1. Describe cross-pointing.
2. Describe a luff-tackle purchase. State its use and the power gained.
3. State the order in which rigging goes over lower mast-head.
4. Rig purchases and send up half-tops.
5. Reeve top-sail buntlines.
6. Bend a spanker.
7. Ship heads W. NW., a sail is reported 1½ points forward port beam; how does it bear?

III.

1. Make a round-turn and half-hitch.
2. Describe water-whips. State their use.
3. Measure for and fit bowsprit-shrouds.
4. Send up and place topmast rigging.
5. Reeve royal halyards.
6. Make all preparations for heaving up an anchor.
7. Ship heads SE. ½ E. on port tack; how will she head on starboard tack?

IV.

1. Make a roband hitch.
2. Rack a heavy purchase.
3. Measure for and fit jumpers.

4. Reeve top-pendants and tackle, and fid topmasts.
5. Reeve top-gallant halyards.
6. Describe and rig fish-boom.
7. Ship heads E. NE. ¼ E. on port tack; how will she head on starboard tack?

V.

1. Make a black-wall hitch.
2. Describe a winding-tackle. State its use.
3. Measure for and fit jib-guys.
4. Set up topmast rigging.
5. Reeve top-sail halyards.
6. Bring-to on a cable.
7. Ship heads E. by S. on port tack; how will she head on starboard tack?

VI.

1. Make a fisherman's bend.
2. From where should the hauling part of a tackle lead in order to give the greatest power? Why?
3. Measure for and fit bob-stays.
4. Ship a topmast cap.
5. Reeve a top-gallant lift.
6. How are buoys fitted, attached to an anchor, and used?
7. Ship heads SW. ¾ S. on port tack; how will she head on starboard tack?

THIRD CLASS.

GUNNERY.

JANUARY, 1873.—SPECIMEN QUESTIONS.

I.

1. When the number of rounds fired from a gun is not known, how may an estimate be made of the probable number?
2. What is the diameter of the vent in all guns of the Dahlgren pattern?
3. What is directed to be done with condemned powder?
4. What is said about stopping the vent?
5. What general suggestions are given with reference to the exercise of boarders?
6. To what proofs are cannon subjected before being received?

II.

1. Explain the Star gauge and its use.
2. When all the men are required to leave suddenly the gun which they are working, what precautions are to be observed?
3. When tanks are empty in a ship's magazine, what is to be done with them, and why?
4. How are friction-primers and spur-tubes used?
5. What sights are used with pivot-guns for great elevations?
6. What is the blowing-charge for all shells?

III.

1. What is done at the command "sponge, load, and shift breechings?"
2. Do all the guns of a division receive powder by the same chain of passing scuttles?

3. How many men are stationed at an 11-inch pivot-gun?
4. What is richochet firing, and when is it used?
5. At general quarters, when bodies of men are called from their stations for any purpose, where will they go, unless otherwise specially directed at the time?
6. What is the weight of a 15-inch shot?

IV.

1. In making arrangements to deliver and distribute powder from the magazines for action, what general considerations and rules should govern?
2. When the magazines or shell-rooms are opened, what precautions are to be taken by those serving in and about them?
3. When assembled at quarters for inspection, what exercise is directed without casting loose the guns?
4. How should powder in barrels be stowed in shore magazines?
5. What is one of the principal objects of supplying empty shells to ships?
6. How many flap-holes should there be in the magazine-screen?

V.

1. How are the different classes of Navy powder designated, and what are their initial velocities?
2. Explain the trunnion-rule and its use.
3. Who leads the boarders, and which of the division-officers are first and second boarders?
4. How do vessels of war receive their supply of ammunition?
5. How many pump-men are there, and in how many divisions are they arranged?
6. What is done at the command "Cease firing?"

VI.

1. Explain the arrangement and stowage of shell-rooms.
2. What color are all projectiles to be painted?
3. In filling cartridges, what precautions are to be taken to insure uniformity of weight?
4. How may the loader know when the charge is home?
5. How are shells emptied?
6. What are the charges of powder for a 9-inch gun?

VII.

1. What returns are to be sent to the Bureau of Ordnance at the end of each quarter?
2. Who keeps a record of the expenditures, who makes up the returns, and when are they to be ready to send in?
3. At general quarters, what hatchways are covered?
4. How is all powder for great guns stowed on board ship?
5. What arrangements are made for the accommodation of the wounded, and at general quarters who is responsible for their being carried out?
6. What is done by the shell-man at the command "Cast loose and provide" in broadside exercise?

VIII.

1. Explain the method of throwing guns overboard.
2. When all the guns of a deck are of the same caliber and class, how many chains of scuttles are necessary?
3. Of what will the powder-division consist?
4. What is *firing at will*, and when should it be done?
5. How are shot and shell to be passed up, and how are shell-whips rigged?

THIRD CLASS.

TRIGONOMETRY.

JANUARY, 1873.—*Time allowed, five hours.*

1. Deduce from the fundamental formulæ the sine, cosine, and tangent of $2x$ and $\frac{1}{2}x$, in terms of the functions of x. Given $y = \sin^{-1} x$, express x in terms of y, and find the functions of y in terms of x. Find the value of the expression—

$$\sin^{-1}\frac{x}{8} + \cos^{-1}\frac{x}{8} + \text{vers}^{\;1}\frac{x}{2}, \text{ when } x = 4.$$

2. The angle subtended by the main-mast of a ship is 57′ 35″, and that subtended by the mizzen is 43′ 25″; the height of the main-mast is 187 feet 9 inches: find the distance of the ship and the height of the mizzen.

3. Show to what the square of any side of a plane triangle is equal, and, from the result and fundamental formulæ, deduce an expression for $\sin^2\frac{1}{2}$ A.

4. The sides of a plane triangle are, $a = .003416$, $b = .0007823$, $c = .00391$: find the length of the perpendicular let fall on c from the vertex of the opposite angle.

5. Required to find the perpendicular height of an object C, above the horizontal plane, D being the projection of the point C on the plane, and A B D a line drawn in the plane; given A B = 200 yards, C A B = 2° 30′, C B D = 3° 30′.

6. In the equation, $\tan(x + z) = m \tan z$, given $x = 65°$, and $m = 1.51962$: find all values of z less than 360°.

7. Deduce a formula for, $\cos^2\frac{1}{2}$ A in a spherical triangle, and apply the result to the polar triangle.

8. Given L = 37° 58′ N., d = 18° 10′ 20″ S., h = 27° 30′ 40″: find t, deducing necessary formulæ in terms of L, h, and p.

9. Given t = 52° 23′ 6″, d = 3° 17′ 40″ N., L = 12° 15′ 34″ N.: find h and Z, deducing formulæ by Napier's rules.

10. Given A = 115° 36′ 45″, B = 80° 19′ 12″, a = 114° 26′ 50″: solve the triangle.

THIRD CLASS.

TRIGONOMETRY.

SPECIAL EXAMINATION, MAY, 1873.—*Time allowed, five hours.*

1. Take from the tables log sin 183° 15′ 17″, log cos 205° 30′ 31″, log tan 30° 44′ 30″, log sec 111° 10′ 25″, $\log \sqrt[6]{.000003815}$.

The tangent of an angle is positive, and its secant is negative, the log tan is 0.37148: find the angle. Find the number corresponding to the logarithm 7.00025 (—10). Find the natural tangent of 30′ 30″. $x = \sin^{-1} 0.25382$: find x.

$$y = \text{vers}^{-1}\, 2: \text{ find } y.$$

2. The tangent of an angle is m: find expressions for the sine, cosine, and secant of the same angle and for the tangent of an angle twice as great.

From the equation—

$$\cos 2x = \tfrac{1}{6},$$

find the sine of x and the cosine of x without using tables; square roots to be indicated only.

3. Find the value of the expression,

$$\left\{ \sqrt[5]{\frac{a^3bc^2d^{\frac{1}{2}}}{e^3fg^5}} + 0.9955668 \right\}^{\frac{1}{8}},$$

Given $a = 10798$, $b = 0.00064581$, $c = 0.0087645$, $d = 0.00005381$, $e = 317890$, $f = 0.00835$, $g = 0.9995$.

4. In a right triangle A B C; given A C $=45.608$; C D, a line drawn from vertex of right angle to hypothenuse, 50.075, and the angle A C D $=50^\circ\ 45'$: find A B.

5. In a plane triangle, given $a=30.238$, $c=49.001$, $A=32^\circ\ 18'\ 20''$, deduce formulæ, and solve the triangle.

6. Prove that in any spherical triangle the cosine of either side is equal to the product of the cosines of the other two sides, plus the continued product of the sines of those sides into the cosine of the included angle; and from the result deduce an expression for $\cos^2 \frac{1}{2} A$.

7. Write the formulæ for the solution of spherical right triangles. Given $c=140^\circ\ 21'\ 16''$, $a=20^\circ\ 19'\ 11''$: solve the triangle.

8. Given $b=121^\circ\ 31'\ 31''$, $c=71^\circ\ 21'\ 30''$, $A=50^\circ\ 11'\ 10''$: find a and B, deducing formulæ by Napier's rules.

9. Given $a=101^\circ\ 13'\ 28''$, $b=51^\circ\ 30'\ 20''$, $c=65^\circ\ 21'\ 16''$: find all the angles.

10. Given $t=30^{\mathrm{m}}\ 30^{\mathrm{sec}}$, $d=20^\circ\ 19'\ 10''$ S., $h=30^\circ\ 30'$: find L.

THIRD CLASS.

ANALYTICAL GEOMETRY.

MAY, 1873.—*Time allowed, five hours.*

1. Deduce the equation to the straight line, in terms of its intercepts, and also in terms of a perpendicular from the origin upon the line, and the inclination of this perpendicular to the axis of X. The vertices of a triangle are at the points (3, 5), (6, 10), and (0, 8); find the length of the perpendicular from the vertex (0, 8) upon the opposite side.

2. The line $y=mx+b$ cuts the line $y^2=4ax$: find the co-ordinates of the points of intersection, the length of the intercepted chord, and the co-ordinates of its middle point. From a consideration of what this chord becomes when the line is a tangent, deduce the equation to the tangent in terms of the *direction ratio.*

3. Deduce the rectangular equation to the ellipse, origin at center, and from the result deduce the polar equation, the pole being at the left-hand focus, and the axis of X the initial line. Find the expression for the length of a focal chord.

4. Deduce the equation to the tangent to the parabola in terms of the co-ordinates of the point of contact; find the equation to the normal; find expressions for the length of the sub-normal and sub-tangent, and prove that perpendicular tangents meet on the directrix.

5. Given one branch of a hyperbola, determine its principal axes, foci, asymptotes, and directrix, and construct the other branch of the curve. Finally, construct a pair of conjugate diameters, one of which makes an angle of 45° with the transverse axis.

6. State what kind of line is represented by each of the following equations, and construct the last two:

1. $xy+3x=4y$, 2. $3ax+5by=c^2$,
3. $2x^2+3xy+y^2=16$, 4. $x^2-4xy+4y^2-2x=5$,
5. $x^2-6x=8y-y^2$, 6. $x^2-xy+y^2=12$.

7. Trace the curves—

$$y=\log_{10} x \text{ and } x^2+y^2=\frac{16x^2}{8x-x^2}.$$

8. Prove analytically the correctness of two constructions of the ellipse, one of them consisting in finding the intersection of certain straight lines, drawn from the extremities of conjugate diameters.

9. Find what the equation to the circle $x^2+y^2=a^2$, and that to its tangent, $y=mx$

$+ a\sqrt{m^2+1}$ become, when the origin is removed to the point $(-2a, 0)$; and find the rectangular equation to the locus of the foot of a perpendicular let fall from the new origin upon the tangent; also, the polar equation to the same locus, the pole being at the new origin, and the axis of X the initial line.

10. Draw the lines O X and O Y at right angles, take any distance, as O C, on O X, and through C draw A C cutting O Y at A, and making an angle of 45° with O X. In the prolongation of X O, lay off $OD = a$, and draw A D; bisect A D in B, and draw B E perpendicular to A D cutting O Y at E; finally, draw E P parallel to O X, cutting A C at P. Find the equations to the lines A P, A D, B E, and E P, denoting the variable distance O C by p. Find the equation to the locus of the point P, and state to what class of lines this locus belongs.

THIRD CLASS.

STEREOGRAPHIC PROJECTIONS.

MAY, 1873.—*Time allowed, two and a half hours.*

1. Explain the difference between stereographic and orthographic projections. What is a *line of measure?* Show the relation which exists between the altitude of the elevated pole and the latitude of the place. Show what is the distance of the projection of any point from the center of the primitive circle in both the orthographic and stereographic projections.

2. Show what is meant by a *sub-contrary section*, and prove that the sub-contrary section of an oblique cone with a circular base is a circle; apply this to the projection of a small circle of the sphere.

3. Project the sphere on the plane of the ecliptic, showing the colures, tropics, arctic circle, and equator, and those meridians which make angles of 15°, 30°, and 45° with the equinoctial colure.

4. Given $L = 45°$ N., $d = 15°$ S., $h = 15°$; project the astronomical triangle on the plane of the horizon. Given $L = 30°$ N., $d = 30°$ S., $h = 22° 30'$; project the astronomical triangle on the plane of the meridian, the point M being west of the meridian in both cases.

5. Given $t = 30°$, $h = 60°$, d 15° N.; project the astronomical triangle on the plane of the equator.

THIRD CLASS.

CHEMISTRY.

MAY, 1873.

1. What is meant by an element in chemistry? What is the elementary composition of air and water, and what are the more important constituents of the earth and of organic bodies?

2. What is nitric acid, and how is it made? How can the proportions by weight of the materials used be calculated?

3. How is sulphuric acid made? Explain the reactions.

4. How are alcohol, ether, and acetic acid related chemically, and how are they severally made?

5. What is quick-lime? What causes the setting or hardening of lime-plaster? What causes the deposit which forms in fresh and in salt water boilers?

6. What is "white arsenic?" How can it be detected? What is the best antidote? What is the principle of the action of antidotes to poisons?

7. Give the chemical names and formulæ of the following substances: gypsum, copperas, chalk, calomel, chloride of lime or bleaching-powder, zinc-white, blue vitriol, glauber-salts, sal-soda, oil of vitriol.

8. Interpret the following formulæ, giving the chemical and common names: $Mg\,SO_4, 7\,H_2\,O$; $Fe_2\,Cl_6$; $Hg\,Cl_2$; $Ca\,H_2\,O_2$; $Pb\,N_2\,O_6$; $Al_2\,K_2, 4\,SO_4, 24\,H_2\,O$; $C_2\,H_5\,HO$; CO; $N\,H_4\,Cl$; $Si\,O_2$.

9. What is the chemical distinction between cast iron, wrought iron, and steel?

10. Of what is gunpowder composed, and what takes place when it burns or explodes?

THIRD CLASS.

PHYSICAL GEOGRAPHY.

JANUARY, 1873.—*Time allowed, five hours.*

1. Give an estimate of the extent of surface elevations and depressions, and a comparison between the maxima of the two. What is the character of the line of separation between Europe and Asia? Define *coast-line*, and state in general terms the characteristics of the coast-lines of Asia, Europe, Africa, and America.

2. Name and describe the three classes of coral islands, and give an example of each class. Explain the tides.

3. Describe the great mountain axes of the globe; stating their direction, length, the mountain systems included in each, the character of their slopes, and the position of the greatest elevations. State the two theories as to the origin of volcanoes.

4. What are plateaux? What are the chief characteristics of plateaux? Name the great plateau of North America. Describe the position, extent, and character of the "Great Basin."

5. Explain *water-sheds;* various character of the sources of rivers. Give an example of drainage areas of large extent connected by natural means. Explain the different forms of flood moderators, and their modes of action.

6. What are the two classes of currents, and what are the peculiarities of each? Explain the origin and importance of currents. Describe the effect of evaporation in the Red Sea and in the Mediterranean. The Gulf Stream; its extent, course, temperature, and general character.

7. Explain the formation of glaciers, and describe their general character. State fully the theory of glacier motion. Define the terms *iceberg, nèvé, moraine, glacière.*

8. Explain the cause of (1) the land and sea breezes, (2) the trades, and (3) the monsoons; and tell in what regions and latitudes the two last are most powerful.

THIRD CLASS.

RHETORIC.

MAY 20, 1873.—*Time allowed, four hours.*

1. What is diction? State the essential qualities of good diction, and tell in what each consists. Explain Campbell's law.

2. Name and define the various kinds of sentences, according to the rhetorical classification, giving examples of each kind and showing how the example comes under its particular class.

3. Give the five rules for the construction of sentences, and tell what special quality of style is gained by following each principle. In the construction of sentences, what are the chief sources of ambiguity? Give examples in which this effect is produced, and show how in each case it may be prevented. What rules must be followed in order to insure strength?

4. What is a figure of rhetoric? Give two explanations of the origin of figures Explain simile and give an illustration. Why are similes a source of pleasure? Of the principles, which are said to govern the use of similes, give any three, and make the application of each to an example. Define *hyperbole*, *epigram*, *antithesis*, *synechdoche*, and give illustrations of each.

5. Write a reply, in official form, to the following letter:

UNITED STATES NAVAL ACADEMY,
Annapolis, Md., May 20, 1873.

GENTLEMEN: You will submit to me a detailed report, based on the information obtained during your summer cruise last year, containing a brief description of Annapolis Harbor, together with your opinion as to the extent of its commerce, judging from the number of vessels sighted.

You will give some account of the state of the weather while in Chesapeake Bay, of the landmarks, depth of water, &c.; the character of the anchorage in Hampton Roads, and the security it offers against gales; and the nature and extent of the fortifications in and around the roads.

Very respectfully, your obedient servant,

——— ———,
Head of Department of English Studies, History, and Law.
Cadet-Midshipmen of the Third Class.

THIRD CLASS.

FRENCH.

MAY, 1873.

Translate the following from Sadler's "Petit Cours de Versions," *into French:*

Humanity of Louis XIV.—During the reign of Louis the Fourteenth, an Italian chemist named Poli came to Paris, and having obtained an audience of the King, informed him that he had discovered a composition ten times more destructive than gunpowder. Louis was fond of chemistry, and ordered the Italian to prepare the composition, and to make the necessary experiments on a certain day in his presence. It was done, and everything succeeded according to the wishes of Poli, who then observed to the King that it would give him a great superiority over his enemies. "It is true," said Louis, "and your invention is very ingenious; but mankind already possess sufficient means of destroying each other; you shall be handsomely rewarded for your trouble and ingenuity, but I charge you, for the honor of human nature, never to divulge your secret."

Translate into English—

1. Où alliez-vous hier matin, quand je vous rencontrai avec votre fusil?
2. Savez-vous combien il y a de Baltimore à Philadelphie?
3. Cette grande maison n'a-t-elle pas changé de maître?
4. Faut-il avoir un passe-porte pour voyager en France?
5. Les chemins de fer et les bateaux à vapeur sont-ils très-nombreux en Amérique?
6. Êtes-vous plus grand que moi de deux ou de trois pouces?

1. How many genders are there in French?
2. Why, in interrogative phrases, does the third person singular, ending with a vowel, require a *t?*
3. How does *le*, preceded by *de*, become *du?*
4. How can a sentence be rendered negative?
5. How is a noun preceded when used partitively in a negative sentence?
6. Suppose the noun used partitively is preceded by an adjective, how then?
7. What is the general place of adjectives? State exceptions.
8. What are the demonstrative pronouns?
9. Give general rule for formation of plural, with the different exceptions.
10. State general meaning of the words *en* and *y*.
11. By what are adverbs of quantity followed when followed by nouns?
12. Do the French use the cardinal or ordinal numbers in speaking of the days of the month?
13. What verb is used in speaking of the time of day?
14. How many conjugations are there, and how are they distinguished?
15. State what is meant by regular, irregular, and impersonal verbs. Give an example of each.
16. Explain idiomatic use of *aller* and *venir*.
17. Explain the different uses of the article in French.
18. What is a reflective verb? Give an example.
19. Explain the circumstances governing changes of past participle.
20. What auxiliary is used with reflective verbs?
21. Give all the tenses of the verbs *avoir*, *étre*, *aller*, *venir*, *pouvoir*, *vouloir*, *arriver*, *envoyer*, *prendre*, *voir*.

Conversation in French.

SECOND CLASS.

SEAMANSHIP.

MAY, 1873.—ORAL EXAMINATION; SPECIMEN QUESTIONS.

I.

1. By the wind under all sail, to reduce sail to a squall.
2. Set a foresail; moderate breeze, yards braced up.
3. Transport an anchor from the waist to the bow.
4. Secure an anchor for sea.
5. Reeve spanker-sheets.
6. Rattle down lower rigging.
7. Take two reefs in the courses.

II.

1. Wear ship short around.
2. Take in a mainsail; moderate breeze, yards braced up.
3. Boat alongside, manned, take charge, pull away from the ship; give all the orders and show how they are executed.
4. Get chains on board and secure them.
5. Reeve jib down-haul.
6. Shears being in place, mizzen-mast on shore, hoist it on board and step it, (ship in the stream.)
7. Measure for and fit royal back-stays.

III.

1. Box-haul a ship.
2. Take in top-gallant sails; moderate breeze, yards braced up.
3. Unbend a jib.
4. Pass a deck-stopper; describe dog-stoppers.
5. Reeve fore buntlines.
6. Measure for each pair of lower shrouds in the order they go over the mast-head.
7. Rig a spanker-boom.

IV.

1. By the wind, heave to, to sound, or to lower a boat.
2. Set top-gallant sails; moderate breeze, yards braced up.
3. Send down top-gallant and royal yards, (port routine.)
4. Make preparations for heaving up an anchor.
5. Reeve lower studding-sail clew-line.
6. Measure for forestays.
7. Rig a bowsprit.

V.

1. Wind on starboard quarter, under all drawing sail, man overboard, what do?
2. Take in a foretop-sail, fresh wind, (or gale,) yards braced up.
3. Unbend a course.
4. Bend a hemp cable to an anchor.
5. Reeve jib-halyards.
6. Measure for and fit royal rigging.
7. Send aloft and cross a top-sail yard.

VI.

1. Ship comes to against the helm; what do? (Box her off.)
2. Take in a spanker, blowing fresh.
3. Loose sails to a bowline.
4. Describe and pass nippers, (hemp messenger.)
5. Reeve throat-halyards.
6. Measure for and fit top-gallant back-stays.
7. Reeve heel-rope of and rig jib-boom and rig it out.

SECOND CLASS.

NAVAL TACTICS.

MAY, 1873.—ORAL EXAMINATION; SPECIMEN QUESTIONS.

I.

1. Change from the order of convoy to the order of battle on the starboard line of bearing, when before the wind, or with the wind abaft the beam on the starboard tack.
2. Pass the *rear* to windward to form the *van* when in order of battle.
3. Describe briefly the battle of Lake Erie and points in tactics involved.
4. Suppose a fleet steering west, and signal is made; form first order on port line or bearing; wind NE.: required the relative bearings.
5. Fleet being in line, heading N., change front to the right, to the NE.

II.

1. Change from the first order of sailing to the fifth, on the *present* line of bearing forming on the *van* squadron.

2. Invert the order of battle on the *other* line of bearing by *tacking*.
3. Describe briefly the battle of Trafalgar.
4. Fleet is in bow-and-quarter line; how form the order of battle on the same line of bearing?
5. Fleet being in double column, break it into column of vessels.

III.

1. Change from the third order of sailing (wind N.) to the order of battle on the starboard line of bearing.
2. Restore the line of battle on the port (same) tack, the wind having hauled forward, by forming on the center ship.
3. Describe Byng's action off Minorca.
4. Define the fifth order of sailing. What are its advantages?
5. Fleet being in line, heading N., form it into double columns from center of divisions, preserving the original direction.

IV.

1. Change from the first order of sailing to the order of retreat by bearing up in succession.
2. Tack together; fleet in line of battle.
3. Describe the manner in which Sir Samuel Howe occupied the roadstead of Basseterre.
4. When the wind hauls suddenly more than four points, what is done before re-forming the order?
5. Fleet being in line, form it into two lines in the order of battle.

V.

1. Change from the order of retreat to the order of battle on the starboard line of bearing.
2. Restore the order of retreat, the wind having changed.
3. Describe Lord Rodney's action in the West Indies.
4. What are the advantages of the weather-gauge?
5. Fleet being in line, heading N., form it into double *echelons* from the center of divisions, preserving the original direction.

VI.

1. Change from the second order of sailing to the order of convoy.
2. Wear in succession, fleet being in line of battle.
3. How did Lord Howe moor his fleet to defend the channel at Sandy Hook?
4. Define the third order of steaming, and state its advantages.
5. Fleet being in columns of vessels, from the right of divisions, form it into double columns.

SECOND CLASS.

SHIP-BUILDING.

JANUARY, 1873.—SPECIMEN QUESTIONS.

1. Describe the building-slip and building-blocks upon which a vessel is built.
2. Describe the method of joining the several pieces of which the keel is composed, fastening and regulating them.
3. Describe and locate the *stem*, *apron*, *dead-wood*, and *stemson*; state how they are secured together and to the keel.

4. Describe and locate the *stern-post*, *inner-post*, *after dead-wood*, and *stern-post knee*; state how they are secured together.
5. Name and locate the several timbers comprised in a single frame.
6. Describe the *knight-heads*, *hawse-pieces*, and *cants*.
7. Describe the method of framing and regulating a vessel.
8. Where are filling timbers placed, and for what purpose are they used?
9. Describe the *main*, *sister*, and *boiler-keelsons*, and state how they are secured.
10. Describe the method of diagonally bracing a vessel.
11. Where and for what purpose are breast-hooks, deck-hooks, and stern-hooks used?
12. Where are the deck-clamps, bilge-strakes, and thick-strakes placed?
13. Describe and name the parts of the planking on the outside of a vessel.
14. Name and locate the pieces comprising a deck-frame.
15. Describe the method of securing the beams to the sides of the vessel.
16. Name and locate the several parts of the head of a vessel.
17. Describe the construction of the wooden, iron, and equipoise or balance rudders.
18. Describe the construction and fitting of a magazine.
19. Name the bolts, bits, and fixed blocks required, in connection with the working of the sails, on the spar and top-gallant forecastle decks and in the bulwarks.
20. Describe a dry-dock and the method of docking a vessel in it.
21. Describe a sectional dock and the method of docking a vessel on it.
22. Describe a balance-dock and the method of docking a vessel in it.
23, Describe the ways and cradle used in launching a vessel.
24. Describe the method of launching a vessel.
25. Describe how the launching of a vessel that has stopped on her ways may be completed.

SECOND CLASS.

GUNNERY.

MAY 20, 1873.—*Time allowed, five hours.*

I.—CANNON-METAL.

Production of gun-iron; name and define the processes to which iron is subjected in passing from crude to pig metal. Explain the method of working the blast-furnace.

II.—MANUFACTURE OF CANNON.

Give the details of the fabrication of heavy cast-iron guns; preparation of mold, core, and pit; charging the furnace and melting down the charge; casting; cooling.

III.—MANUFACTURE OF GUNPOWDER.

The ingredients; how obtained; treatment of materials before incorporation; incorporation; graining, glazing; what influences affect the explosive force of gunpowder, and how can the amount of this force in cannon be ascertained?

IV.

Describe the Navy time-fuze, and tell how it is made.

SECOND CLASS.

INFANTRY TACTICS.

JANUARY, 1873.

1. Give the formatien of a regiment in order of battle, with posts of all the officers and non-commissioned officers.
2. Describe the position of carry arms; from carry arms to support arms; from sup-

port arms to carry arms; from carry arms to present arms; from carry arms to order arms; from carry arms to fix bayonet; from carry arms to charge bayonet; from carry arms to right shoulder shift arms.

3. How stack arms?
4. How fire by company? By file? By rank?
5. How form company, count fours, and complete left fours?
6. How wheel company from a halt and change direction on the march?
7. How form column of fours to the front?
8. How march by twos and re-form fours?
9. How break fours to the rear in passing obstacles?
10. How execute *fours-right-about* in column and in line?

SECOND CLASS.

ASTRONOMY.

May, 1873.

1. Define the solar system; its nature; its laws. Explain the nebular theory, and give the supporting facts. Give the relative position, magnitude, and peculiarities o each planet.

2. In reference to the earth, what is its mean distance from the sun, and how obtained? What is its orbit, and how found? How is the fact of its diurnal rotation proved? How is its true shape ascertained? What is its sidereal period in solar and sidereal days, and from what does this difference arise?

3. How are the size and shape of the moon found? How are its distance from the earth and the shape of its orbit obtained? What are its phases, and how explained? How is the law of universal gravitation verified by the moon's motion? What is a lunar month? What is the moon's sidereal period? Describe the moon's physical condition.

4. What is solar, and what is sidereal time? What is the theory of the "equation of time"? Explain the theory and the laws of tides. What is the common, and what is the corrected establishment of a port? What is the luni-tidal interval? How is the time of high water at a given port found?

5. What is latitude? How determined by astronomical observations? Explain the instruments used. What is longitude, and how obtained? What are the two systems of celestial co-ordinates, naming the origin in each case?

6. Explain the phenomena of seasons; of twilight; of eclipses, solar and lunar. How may the latter be predicted?

7. What are fixed stars? What is proper motion? What is aberration, and what the consequent displacement of stars? How are fixed stars classified? How is the local mean time of their crossing a given meridian computed?

SECOND CLASS.

INTEGRAL CALCULUS AND MECHANICS.

May 21, 1873.—*Time allowed, four and a half hours.*

1. Find the whole area of the curve whose polar equation is $r=2a\cos 2\theta$.

2. Investigate *Simpson's Rule*, and apply it to the following example. The ordinates (taken at intervals of 6′) of the load water-line of a schooner are as follows:

1.	0.00	4.	7.58	7.	7.62	10.	2.62
2.	1.46	5.	8.62	8.	5.56	11.	0.00
3.	4.92	6.	8.62	9.	4.21		

Find the area.

3. Find the center of gravity of an elongated shot with a parabolic head, the shot having a conical cavity in its base one-half of a caliber in depth, the length of the body being two calibers, and that of the head one and a half calibers.

4. A rubber ball drops from the main-yard of a ship and rebounds to the height of 51.2 feet; the coefficient of elasticity being $\frac{4}{5}$, find the height of the yard.

5. Deduce the equation to the path of a projectile in a non-resisting medium; find the greatest height it attains, its range, and time of flight on a horizontal plane.

6. The range of a shell at 30° elevation is 3,600 feet; what must be its elevation to strike an object at the distance of 2,700 feet, using the same charge?

7. Find the length of a fuze necessary to cause a shell to explode on reaching the ground, the shell being fired at an elevation of 45°, and with an initial velocity of 500 feet, the ground being horizontal, and the fuze burning at the rate of one-sixth of an inch per second.

8. Compare the mechanical effect of a 15-inch shot, (weighing 450 pounds,) moving at the rate of 1,500 feet per second, with that of a ship weighing 3,000 tons, and moving at the rate of eight statute miles per hour.

9. A ship pitching in a seaway, raises her bow with a variable velocity such that the vertical component of its acceleration is 16 feet: find the pressure of a pivot-gun and carriage weighing 18,000 pounds, on the deck of the forecastle.

10. Deduce a general expression for the time of oscillation of a simple pendulum.

11. At what rate would a locomotive engine, working at 60 horse-power, draw a train up an inclined plane of one in a hundred, supposing the train and engine to weigh 60 tons, and the friction to be 6 pounds per ton?

12. Find how many units of work are stored up in a mill-pond which is 100 feet long, 50 feet broad, and 3 feet deep, and has a fall of 8 feet.

13. Find the position of the center of pressure of a rectangle, immersed vertically in water, with one edge horizontal, and at the distance *a* below the surface.

14. In the wall of a dam is a rectangular gate, 6 feet deep and 2 feet broad, which rotates on a horizontal axis, and opens when the surface of the water is 15 feet above the axis: at what height on the gate is the axis placed?

15. A ship sailing from the sea into a river sinks 2 inches, but after discharging 30, tons of her cargo, rises $1\frac{1}{2}$ inches: determine the weight of the ship and cargo together the specific gravity of sea-water being 1.025, and the horizontal section of the ship for 2 inches above the water-line being invariable.

16. A vase filled with mercury weighs 5,440 grams; when 100 grams of powder are placed in the vase and it is *then* filled with mercury, it weighs 4,765.71 grams: the specific gravity of mercury being 13.55, find that of the powder.

SECOND CLASS.

MECHANICS AND DIFFERENTIAL CALCULUS.

JANUARY 30, 1873.—*Time allowed, five hours.*

1. Prove that the algebraical sum of the moments of two forces round any point in the plane containing the two forces, is equal to the moment of their resultant.

2. Find the co-ordinates of the center of gravity of a trapezoid.

3. A top-sail yard weighing 6,300 pounds, hangs by the lifts: find the tension on each lift, the length of the yard being 80 feet, and its distance below the cross-trees 42 feet·

4. A cask weighing 400 pounds is eased down a gang-plank, resting at an angle of 30° with the horizon, by means of a parbuckle consisting of two ropes leading inboard parallel to the gang-plank: find the strain on each rope.

5. Four men, pulling 200 pounds each, are just able to prevent a hawser, which has two and a half turns around a post, from slipping: find the greatest strain on the hawser, the coefficient of friction being 0.2, and π being taken as $\frac{22}{7}$.

6. Find the distance of the center of effort of a spanker from its luff, its dimensions being: — foot, 36 feet; head, 25 feet; luff, 30 feet; perpendicular distance of the peak above the foot, 37 feet; and the angle between the foot and the luff, 90°.

7. The angle formed by the two parts of the collar of a stay is 60°; the rope forming the stay being $2\sqrt{3}$ inches in circumference, what should be the size of the rope forming the collar, the strength of rope being proportional to the area of its cross-section?

DIFFERENTIAL CALCULUS.

8. From the differential of $\log x$, deduce expressions for $d\,(x^m)$, $d\left(\frac{x}{y}\right)$, and $d\,(a^x)$.

9. Deduce the differential of $\cot^{-1}x$.

10. From the expression for $d\,(\sin x)$ deduce an expression for $d\,(\sec x)$ in terms of dx.

11. Show how the differentials of the inverse trigonometrical functions may be deduced.

12. Differentiate the expressions $e^x \log \sin x$, $\left(\frac{x}{1+x}\right)^m$ and $\tan a^{2x}$.

13. Develop e^x into a series by Maclaurin's formula, and compute the value of e, correct to the seventh place of decimals.

14. Determine the angle which a rudder makes with the keel of a ship when its turning effect is the greatest possible.

15. At a distance of 576 yards from a straight channel, a privateer 300 feet in length is ashore perpendicular to the channel. At what place in the channel, reckoning from the point nearest her, will she subtend the greatest angle?

SECOND CLASS.

ELECTRICITY.

JANUARY, 1873.

1. Give the laws of electrical attractions and repulsions, and show how they are proved by the use of the "torsion balance."

2. What is Faraday's theory of induction? Explain how the specific inductive capacity of substances may be determined.

3. Describe the electrophorus and its mode of action. Explain the action of the Holtz machine.

4. Explain the theory of condensers. Show how the charge of a Leyden jar or battery may be measured.

5. Describe Von Ebner's machine for firing mines, and the fuze used in connection with it.

6. What is a voltaic couple? Explain the cause of the weakness of the current in the one-fluid batteries. Show how in any of the two-fluid batteries the difficulty is partially overcome. How is it overcome in Smee's one-fluid battery?

7. Describe Oersted's experiment, showing the effects of currents upon the magnetic needle, and explain the construction of the galvanometer. Why does the magnetic needle point north and south?

8. Describe the construction and mode of action of the principal parts of the Morse telegraph. Explain the special feature in the electro-chemical telegraph.

9. State and discuss Ohm's law. How would you set up a battery of 300 cells, in order to obtain the greatest intensity, the external resistance being 25, and the internal resistance 3.

10. What is the cause of thermo-electric currents? Describe the electrical pyrometer. What is the effect of passing a current through a thermo-electric couple?

SECOND CLASS.

FRENCH.

MAY, 1873.

Translate into French:—

Dignity maintained.—An ambassador of Charles V, to Soliman, Emperor of the Turks, having been invited to an audience of this monarch, perceived on his arrival that they had arranged seats for every one except himself, and that the Turks left him standing, with the intention of showing their indifference towards his nation. Immediately, and with much *sang froid,* he took off his cloak, folded it up, and seated himself upon it. When the audience was ended, the ambassador rose and took leave without paying the least attention to his cloak. An officer called him, saying, "Sir, you have left your cloak." "O, no," said he, "I have not forgotten it; the ambassadors of the King, my master, are not accustomed to carry their seats with them."

Translate into English:—

1. Avez-vous défendu à cet homme de mettre le pied chez vous?
2. Ne regrettez-vous pas qu'il soit obligé de travailler?
3. Ne faudra-t-il pas que je fournisse des provisions à cette famille?
4. Croyez-vous que ces étudiants puissent apprendre cinq pages par cœur en deux heures?

RULES OF GRAMMAR.

1. How many genders are there in French?
2. How distinguish gender in French?
3. General rules for forming plurals; are there exceptions?
4. How many conjugations, and how distinguished?
5. State general position of adjective; exceptions also.
6. Which number is used in speaking of sovereigns?
7. Give the names of primitive tenses.
8. State when imperfect tense is used.
9. Give definition of imperfect and past definite.
10. State what verbs govern the use of subjunctive.
11. State how imperfect subjunctive is derived.
12. State when pronoun *ce* must be used for *il, elle,* &c.
13. What is a reflective verb, and how conjugated?
14. Suppose a verb has two subjects in the singular, how is verb rendered?
15. Is there any difference between *connaître* and *savoir*?
16. In speaking of the time of day, what verb is used?
17. What verb is used in speaking of dimensions?
18. Explain idiomatic uses of *tenir, faire tenir,* and *être.*
19. State change in the past participle.
20. Give rules for elision and contraction of article.

Conversation entirely in French.

NAUTICAL PHRASES.

Translate from dictation the following phrses:—

1. L'enseigne fut le premier qui aborda l'ennemi.
2. Tout le monde en haut à larguer les voiles.
3. Le maître d'équipage doit être un homme sur lequel on puisse compter.
4. Le vent est droit arrière, mon lieutenant.
5. Un bâtiment en cours de voyage.
6. Cette frégate a perdu son beaupre.
7. Brassez les vergues carre. Brassez au vent.

8. Carguez les voiles. Brassez légèrement sous le vent.
9. Serrez bien les fonds de la voile.
10. Le gaillard d'avant est l'endroit destiné aux apparaux de devant.
11. Le mât de misaine a été emporté par un boulet.
12. Ce bâtiment file dix nœuds à l'heure.
13. Nagez ensemble. Scie bâbord. Nage tribord. Tout à culer. Défie.
14. Touchez-vous? Avez-vous une voie d'eau?
15. À votre arivée, annoncez que tout va bien à mon bord.
16. Quel est le calibre de vos canons?
17. De quelle manière comptez-vous engager le combat?
19. Votre équipage est-il fort en hommes?
20. Sous quelle voilure tenez-vous le mieux la cape?
21. Range à hisser le grand hunier.
22. Mettez en panne; je vous enverrai un canot.
23. Préparez à virer de bord. Trop près.
24. Mâte les avirons. Avirons plats un instant.
25. Hisse et borde le petit foc à bâbord.
26. Garcette de tout de vergue. Fil de caret.
27. Les basses vergues. Silence partout. Ho! du navire.
28. Après avoir amariné la corvette nous entrâmes dans le port.
29. Le bâtiment obéit bien à la barre.

Translate into French the following:—

1. Ready about. Stations for stays.
2. Loose sail. Furl sail.
3. Too close. Let her go off. Steady so.
4. All hands reef topsails.
5. Man overboard. Give necessary orders. Wind aft.
6. Let go the main-sheet. Main clew-garnet is foul.
7. Let her go free a moment. Mind your helm.
8. Bear a hand, my lad. Keep the lead going.
9. Luff and touch her. Hard up the helm.
10. How does she carry her helm, quartermaster?
11. Fore-yard there. Lay in off that yard.
12. Set the t'gallant stun'-sails and flying-jib.
13. Quartermaster, heave the log.
14. Main-topsail buntlines.
15. Come up the cat-fall.
16. Come alongside, coxswain.
17. The shortest watch is the dog-watch.
18. Have you been on board the flag-ship?
19. 50-gun frigate. 18-gun sloop. 6-gun brig.
20. That vessel is homeward bound.

Conversation, in which orders usual on men-of-war are given.

FIRST CLASS.

SEAMANSHIP.

MAY, 1873.—ORAL EXAMINATION; SPECIMEN QUESTIONS.

I.

1. Riding head to wind and tide, get under way, cast to port, and stand out on starboard tack.
2. On a wind, shift a course; moderate weather.

3. Take in a topmast studding-sail.
4. Jib downhaul carries away; what do?
5. Wind on the quarter; all drawing sail; wind shifts abeam; what do? What orders are given in bracing?
6. How is it known when a ship is *on a wind* in a light breeze?
7. What is meant by a *cross in the hawse?*

II.

1. Ship riding head to wind; wind blowing directly in the harbor; moderate breeze; get under way and stand out on a wind.
2. Jib splits; shift it; topmast-staysail stowed.
3. Set a spanker; fresh wind.
4. Shift a topsail-yard.
5. Take in topgallant-sails; fresh wind; yards braced up.
6. Land a boat through a surf; steep beach.
7. What is meant by an *elbow* in the hawse?

III.

1. Station the men and cross topgallant and royal yards at color-hoisting give all the orders and state what is done at each command.
2. Make all preparations for entering port.
3. Set a foresail; moderate weather; yards braced up.
4. Weigh a stream-anchor with a launch.
5. Take in a topmast studding-sail.
6. When is a steamship considered as a sailing-ship; and what is a steamer under steam and sail considered?
7. Trim yards; close hauled; moderate breeze.

IV.

1. Unbend all sails; topgallant and royal yards in the rigging.
2. Wear ship in a moderate or fresh breeze.
3. Take in a mainsail; fresh wind; yards braced up.
4. Riding to single anchor; moor ship in a tide-way.
5. Set topgallant-sails; moderate weather; on a wind.
6. Two steamers meeting end on, or nearly so, so as to involve risk of a collision, what is the duty of each?
7. How is it known when a ship is "full and by" in a light breeze? How in a fresh breeze?

V.

1. Make preparations for bending topsails, courses, jib, and spanker.
2. Box-haul a ship.
3. Take in a close-reefed main-topsail in a gale, lying to.
4. By the wind under all plain sail, wind shifts to quarter; what do?
5. Set a mainsail; fresh wind; yards braced up.
6. Make a diagram of two vessels, A and B. A sees a red, a green, and a top light, and B sees a red and a green light; what are the duties of each?

VI.

1. Riding to a windward tide; wind aft; get under way and stand out on a wind.
2. Hove to; fore-topsail to the mast; fill away.
3. Take in a lower studding-sail.
4. Hoist in guns over all.
5. Set a main-trysail; strong breeze.
6. How does a ship trimmed by the stern carry her helm?
7. Define a neap tide.

FIRST CLASS.

GUNNERY.

JANUARY, 1873.—*Time allowed, five hours.*

I.—CANNON-METALS.

1. Name and define the processes to which iron is subjected in passing from crude ore to pig-metal, with a description of the blast-furnace and method of working it.

2. How is pig-iron classified? Explain what is meant by gray cast iron. What is the average tensile strength of cast iron?

3. Define the term "wrought iron," and state its properties and average tensile strength and limit of elasticity. How is a finished bar obtained from pig-metal?

4. Define the term "steel," and state its properties and average tensile strength. State in general terms what are the two methods of obtaining steel. Describe the processes of cementation, casting in crucibles, and tempering steel in oil.

II.—CAST-IRON CANNON.

Give the details of the method of fabricating heavy cast-iron guns.

1. Preparation of mold, core, and pit.
2. Charging the furnace and melting down the charge.
3. Casting.
4. Cooling.

III.—BUILT-UP CANNON.

1. Definition.
2. Object, methods, and principles of the process.
3. Example. Describe the Krupp gun.

IV.—RIFLING AND PROJECTILES.

1. What is the object of rifling?
2. Define and explain the leading systems of rifling.
3. What are the advantages and the defects of the different systems?

FIRST CLASS.

PRACTICAL NAVIGATION.

MAY, 1873.—*Time allowed, five hours.*

1. April 23, 1872, noon. Took departure from L. H., lat. 15° 20′ S., long. 75° 45′ W.; bearing (*p. c.*) S. by W.; distant 10 miles; ship heading N. by E.; deviation, 3° E.; variation, 17° W. Sailed the following courses, and took observations:

Courses.	Distances.		Wind.	Leeway.	Deviation.
	K.	F.			
N. by E. ½ E	14	2	Northward and westward.	½ point	¼ point E.
N. by E. ¾ E	15	4	do	do	½ point E.
N. N. E	10	6	do	do	Do.
W. S. W. ½ W	9	2	do	do	¾ point W.
W. by S	21	4	do	do	½ point W.
W. ¾ S*	8	6	do	do	Do.
W. ½ S*	9	4	do	do	Do.
West*	7	6	do	do	Do.

* Run to noon.

Observation, meridian alt. April 24: $\underline{\odot}$ 61° 43′ 20″. Height of eye, 20 feet. I. E., —1′ 20.

Time sight and azimuth, about 8.30 *a. m., Apr.* 24.

Watch time of observation	$8^h\ 27^m\ 30^s$
Chro. — watch	$5^h\ 3^m\ 32^s$
$\underline{\odot}$	32° 36′ 50″
Bearing of sun	N. 87° E.
Chronometer correction	+ $4^m\ 10^s$

Required.

Lat. D. R., long. D. R., Lat. obs., long. obs. Course and distance made good, current and variation.

2. October 2, 1872.—Naval Academy Observatory, long. $5^h\ 5^m\ 57^s.52$ W. Observed transit of star "*a* Corona Borealis."

Clock Times.

h.	*m.*	*s.*
15	14	02
15	14	15
15	14	28
15	14	41
15	14	55

Comparison.

Sidereal clock	$15^h\ 18^m\ 05^s.5$
Chronometer	2 34 00.

Required the error of clock on sidereal time and of chronometer on local mean time.

3. October 29, 1872.—Long., 77° 35′ E.; I. C., + 2′; eye, 18 feet. Observed meridian altitude $\underline{☽}$ 78° 20′ 15″, bearing south. Required the latitude.

4. December 22, 1872, $5^h\ 55^m$ p. m.; long., 162° E. Observed altitude of *Polaris*, 80° 15′; eye, 18 feet; I. C., + 2′. Required the latitude by Coffin's method.

5. Required the time of high water at Singapore, long. 103° 50′ E., on the morning of July 5, 1872.

Corrected establishment, $9^h\ 45^m\ 10^s$.

FIRST CLASS.

PRACTICAL NAVIGATION.

MAY, 1873.—*Time allowed, five hours.*

6. Required the great circle course and distance from lat. 48° 30′ S.; long. 61° 20′ E. to lat. 40° 43′ N.; long. 74° 7′ W.

7. June 12, 1872.—Lat. 14° 20′ S.; long. $4^h\ 24^m$ E.

Watch time of observation	$4^h\ 00^m\ 20^s$ P. M.
Chro. — watch	8 24 00
Chro. correction	+ 10 34

At the same time the angle between the sun's nearest limb and a light-house in the horizon was 42° 13′ 20″; sun to the right of light-house; I. C., + 1′ 10″; eye, 18 feet. Required, the sun's azimuth and the true bearing of the light-house.

8. April 15, 1872.—Lat. D. R. 27° S.; long. E. At 8 a. m., Greenwich chronometer face was slow of local mean time, $4^h\ 18^m\ 12^s$, and slow of Greenwich mean time, $28^m\ 48^s$. Sailed

43 miles S. S. E. Near noon observed $\underline{\odot}$ 51° 30′; chronometer $7^h\ 19^m\ 30^s$;—eye, 18 feet; I. C. + 4′ 12″. Required the latitude.

9. July 10, 1872.—Lat. 39° 59′ N.; long. $5^h\ 5^m\ 57^s.52$ W.

P. M. Comparison.	*A. M. Comparison.*
Chro.—watch $5^h\ 02^m\ 10^s$.	Chro.—watch $5^h\ 02^m\ 13^s$.
Watch time of observation $4^h\ 08^m\ 14^s$.	Watch time of observation, $8^h\ 08^m\ 12^s$.

Required error of chronometer on Greenwich mean time by equal altitudes, (Chauvenet.)

10. May 24, 1872.—Lat. D. R. 43° 30′ N.; long. $4^h\ 12^m$ W.

Required the latitude from two observations taken near noon, by Chauvenet's method.

Watch time obs., $11^h\ 40^m\ 00^s$; $\underline{\odot}$, 67° 20′; watch time obs., $11^h\ 49^m\ 36^s$; $\underline{\odot}$, 67° 31′; eye, 17 feet; I. C., + 2′.

FIRST CLASS.

NAVIGATION.

MAY, 1873.—*Time allowed, five hours.*

1. Deduce the formulæ—

$$(a)\ L = \phi'' \pm \phi',$$
$$(b)\ \tan \phi'' = \tan d \sec t,$$
$$(c)\ \cos \phi' = \sin \phi'' \sin h \operatorname{cosec} d.$$

Discuss these formulæ in full, including an investigation of the effect of an error in the altitude.

2. Investigate the formulæ—

$$\cos z_0 = \sin h + \cos L \cos d \operatorname{versin} t,$$

and

$$h_0 = \tfrac{1}{2}(h + h') + \tfrac{1}{2} t_2 \triangle' h + \frac{[\frac{1}{4}(h - h')]^2}{\frac{1}{4}t^2 \triangle' h}$$

3. Define local mean time and local sidereal time, and show how when either is given the other may be found.

4. Explain the method of finding the longitude at sea by a single altitude, deducing the necessary formulæ. Show how the azimuth of a heavenly body is found from its observed altitude.

5. Explain the various methods by which the deviation of ships' compasses is ascertained.

FIRST CLASS.

STEAM-ENGINERY.

MAY, 1873.—*Time allowed, four hours.*

1. Demonstrate the increased efficiency of steam of 60 pounds pressure per square inch, absolute, over that of 30 pounds, and the theoretical gain per cent. Relative volumes of steam and water 470 and 883, respectively.

2. Find the initial pressure of steam, cutting off at $\frac{1}{3}$ and $\frac{1}{2}$ stroke, to do the same work as steam of 30 pounds absolute pressure per square inch, following full stroke.

3. Calculate the *loss by blowing off* with the following data: total heat, 1200.56°; temperature, 284°; feed-water, 120°; density entering, $\frac{1}{32}$ and maintained $\frac{2}{32}$.

4. Gain by use of feed-water heater. Total heat of steam, temperature, feed, and density as in example 3, in first instance, 2°. Data same as in first example, except feed-water is raised to 180°.

5. A ship makes 10 knots per hour with a screw revolving 60 times per minute, upon which there is a loss from slip of 15 per cent. Required pitch of the screw.

6. Calculate the horse-power of an engine 36 inches diameter, 3-foot stroke, 60 revolutions per minute, 30 pounds of steam per square inch per gauge, 26 inches vacuum, and cutting off at ½ stroke.

7. Cylinder 36 inches diameter; stroke 3 feet; cut off ½ stroke; revolutions 65 per minute; steam 40 pounds per square inch absolute pressure; relative volume of steam 679; coal 2,000 pounds per hour; weight of cubic foot of water, 62.5 pounds. Required the number of pounds of water evaporated per pound of coal.

8. A vessel burns 40 tons of coal per day to make 10 knots per hour; what distance can she make *good* against a 4-knot current, with 400 tons of coal, with the greatest economy?

9. Make skeleton sketches of all the different kinds of engines you know, and state generally their peculiarities.

10. Sketch an ordinary three-ported slide-valve, and explain how it is set, how balanced and how steam is worked expansively by it.

11, What advantages are claimed for a surface over a jet condenser?

12. Safety-valve: short arm, 3 inches; weight, 112 pounds; pressure of steam, 25 pounds per square inch; valve, 10 inches diameter. Required the long arm.

13. How would you proceed to raise steam and prepare for getting under way in the engine-room? Also, what precautions should be taken prior to and after coming to anchor?

14. Describe the most desirable type of steam-launch for ship's use; advantages and disadvantages of various designs; also how to provide for one when required for use.

15. Hot-well, 115°; injection-water, 65°; discharge-water, 90°; steam, 212° temperature, and 1178.6 total heat. Required the quantity of water to condense one pound of steam.

FIRST CLASS.

HEAT.

JANUARY, 1873.

1. Define temperature. Why is mercury generally used in thermometers? Explain the construction of the differential thermometer and its use; also the maximum and minimum thermometer and its use. What number of degrees, centigrade and Reaumur corresponds to —13° F.?

2. What is meant by coefficient of expansion? . Derive superficial and cubical coefficient from linear. Knowing the coefficient of absolute expansion of mercury, how, would you use it to reduce the reading of a barometer to the standard temperature?

3. Give some method of determining the coefficient of expansion of air. What is meant by density of a gas, and how may it be determined?

4. Give laws of fusion and of solidification. How do changes of pressure influence the melting and solidifying points? When a solid dissolves in a liquid, what effect is produced upon the temperature of the substances used?

5. What is a vapor? What is meant by tension of vapors? How does evaporation differ from ebullition? How does pressure affect the boiling point? What is the tension of a vapor in two communicating vessels of different temperatures?

6. Explain what is meant by *hygrometric state*, and show how it is determined by the use of Daniell's hygrometer.

7. Give the laws regulating the causes which modify the intensity of radiant heat, and show how these laws may be experimentally proven. How does the Dynamical Theory account for the radiation and conduction of heat? How does color affect the radiating and absorbing power of bodies?

8. Define thermal unit, and specific heat. Show how specific heat is determined by the method of mixtures.

9. What is meant by latent heat? What is the latent heat of fusion of ice? What of vaporization of water? Example: specific heat of lead, solid .0314, liquid .0402; lead melts at 335° C.; 7 pounds of melted lead at 450° C. are poured into 27.836 pounds of water, raising its temperature from 15° to 20°; what is the latent heat of fusion of lead?

10. Describe the different classes of winds, and give the causes producing them. What are clouds and how are they formed? What effect has aqueous vapor upon climate?

FIRST CLASS.

LIGHT.

MAY, 1873.

1. Discuss the undulatory theory of light. What is the difference between light and heat? What fact proves the emission theory false?

2. Describe Foucault's apparatus for determining the velocity of light. What results are obtained for media denser than air? Show from the physical explanation of single refraction that these results are agreeable to the undulatory theory.

3. What is meant by "index of refraction?" What by "critical angle?" Show what conditions are necessary that light, falling on the first face of a prism, shall emerge from the second?

4. The radius of the curved surface of a plano-convex lens is 24 centimeters: what is the focal distance? The distance of a luminous point from a converging lens is 450 centimeters; distance of image, 24 centimeters: what is the focal distance of the lens? The focal distance of a diverging lens is 10 centimeters; if an object 30 centimeters from the lens be viewed through it, how far from the lens does the image appear, and how much larger or smaller?

5. Describe the spectroscope, and illustrate by a diagram the path of rays through it. How is it used to analyze unknown substances? Explain the dark lines of the solar spectrum.

6. How may lenses be made achromatic? Explain the principle which renders this correction possible. What is the difference between fluorescence and phosphorescence?

7. Show by diagrams the path of rays in the simple microscope, in the simplest form of the compound microscope, in the astronomical telescope, in the terrestrial telescope, and in the opera-glass. Mark all the foci by dots.

8. How are negatives produced on glass? Explain the structure of the eye.

9. What do the numbers engraved on spectacles generally mean, and how may the number which a short or long sighted person ought to use be determined? The distance of distinct vision being 12 inches, what glass must a person use whose distance of distinct vision is 32 inches? One whose distance of distinct vision is 8 inches?

10. Why do we not see objects inverted? Explain the refracting spectroscope. What is meant by double refraction? What is the difference between the ordinary and the extraordinary ray?

FIRST CLASS.

CONSTITUTION OF THE UNITED STATES AND INTERNATIONAL LAW.

MAY 20, 1873.—*Time allowed, four hours.*

1. When was the draught of the Constitution reported to Congress by the Constitutional Convention? When did it go into operation?

What body has the power of impeachment? What body has the power to try impeachments? Who are liable to impeachment?

In what does treason against the United States consist? What is necessary to secure conviction?

State the qualifications for the office of President and Vice-President.

2. Define international law, and state the elements of which it is composed. Explain the sanctions which give it binding force. What institutions existing about the eleventh century contributed to improve the law of nations? On what principles did Great Britain decline to join the other powers of Europe, in 1821–22, in their armed interference in the internal affairs of Naples and Spain?

3. Define *Jus Postliminii;* piracy. What department of the United States Government has the power to define piracies? What is the extent of a nation's jurisdiction over adjoining seas? Over the open ocean? Over bays and gulfs inclosed between headlands? What is the extent of the immunities of ambassadors: (1) as to places; (2) as to persons?

4. What is a just cause of war? Is a formal declaration of war to the enemy now necessary? What is the double effect of a formal public notice of a state of war? What has been settled in the United States with regard to confiscation of debts and enemy's property on the breaking out of a war: first, as to the abstract right; second, as to the practice? On what does the hostile character of an embargo depend?

5. The law of contraband.

6. In the case of a war between Spain and Great Britain, an American vessel, laden with colonial produce, sails from Havana to New York; at New York the cargo is landed and afterwards shipped in another American vessel to Spain; this vessel is captured on the voyage by a British cruiser, and carried into port for adjudication. The English rule prohibits neutrals from engaging in the colonial trade of the enemy, confined to subjects in time of peace, and the captors claim that the neutral is so engaged. Supposing the English rule to be correct, and that the Spanish colonial trade is in general limited to subjects, what would be the test of the legality of the voyage? How are non-commissioned cruisers, committing hostile acts, viewed by the enemy? How by their own government? How are captures made by them regarded?

7. What were the four principles of the declaration of the Congress of Paris in 1856? State what must be done with a prize taken at sea. Between what parties does the question arise as to when the title to captured property passes? When does the title pass: first, as to movables; second, as to real property; third, as to things captured at sea? If a ransomed vessel should be recaptured out of the route prescribed for her return, or after the time allowed for her return, and be adjudged lawful prize, what is the effect of such recapture: first, as to the owners of the vessel; second, as to the original captors; third, as to the recaptors?

8. State the main facts in the case of the *General Armstrong*, and the grounds of the decision rendered by the arbitrator. When can a neutral inquire into the validity of a capture? Explain the principle, "free ships, free goods." What state proclaimed the principle as part of the Baltic Code of Neutrality in 1783, and by which of the great powers was it opposed?

9. What facts are necessary in order to apply the law of blockade in any particular case? What is the effect of the occasional absence of the blockading squadron, whether (1) voluntary, (2) accidental, or (3) caused by a hostile force? What dispatches is it unlawful for a neutral to carry? What may be lawfully carried?

10. Can the right of search be exercised upon men-of-war? Upon merchant-ships sailing under convoy of men-of-war? What is the object of the right of search? What is the penalty for resistance to the legitimate exercise of the right? Name the most material ship's papers.

FIRST CLASS.

SPANISH.

MAY, 1873.—*Time allowed, four hours.*

I.

Translate into Spanish—

1. Avez-vous fait ce que je vous ai dit?
2. Je n'ai rien fait aujourd'hui parce que je suis malade.
3. Quels livres avez-vous lus?
4. J'ai lu ceux que vous m'avez prêtés, et ceux que monsieur votre frère m'a donnés.
5. Avez-vous donné de l'argent au domestique?
6. Je lui ai donné vingt dollars; dix pour payer ce qu'il doit à son tailleur, et dix pour aller au marché.
7. Avez-vous trouvé les livres que vous cherchiez ce matin?
8. Oui, monsieur, je les ai trouvé sous le lit.

II.

Translate into English—

Señores mios y queridos discipulos.

Veo con la mayor satisfaccion aproximarse el termino escolástico que debe ser para vosotros de la mayor importancia, porque va á poner fin á todos los estudios que habeis hecho con atencion y ansiedad, para lograr el honor de recibir el diploma deseado que dar á principio á vuestra honrosa carrera en la marina de los Estados-Unidos.

Tened siempre presente que debeis, tanto por obligacion comó por patriotismo, servir a vuestro pais con lealtad. De este modo podreis contribuir á sostener el honor de este gobierno sin igual, cuyas instituciones liberales han atraido a muchos estrangeros, y estimulado naciones civilizadas á revoluciones con el deseo de imitarle.

Vosotros vais á visitar varios paises en donde podreis aprovecharos de la buena educacion que habeis recibido; os dará la facilidad de ser admitidos en la buena sociedad. Entre los pueblos que visitareis, el conocimiento de la lengua española os será muy ūtil y agradable. Ese idioma es tan rico, tan bello, y tan sonoro, que el emperador Carlos V, distinguido lingüista, ha dicho que era el idioma propio para hablar á Dios.

Esa lengua es la que se habla en la mayor parte de los pueblos que visitan frecuentemente los oficiales de la marina americana y no podreis ménos de reconocer su verdadera utilidad.

Dios os guarde de todo mal, y os dé prosperidad en lo futuro.

Su muy afecto profesor.

E. A. R.

III.

1. How many ways are there in Spanish of addressing a person?
2. How are translated from the English into Spanish two substantives depending on each other without any stop between them, or separated by an apostrophe (')?
3. Why is the pronoun subject, or nominative, sometimes omitted in Spanish?
4. When is *el suyo* used instead of *el de V.*?
5. How are nouns terminating in a short or unaccented vowel made plural?
6. How are those ending in a long or accented vowel made plural?
7. How must adjectives agree with the nouns or pronouns they qualify?
8. What are the augmentative and diminutive nouns in Spanish?
9. How are the augmentative nouns formed?
10. How are the diminutive nouns formed?
11. By what kind of numbers are days of the month expressed?
12. Is there any exception?
13. How many conjugations are there in Spanish?
14. How are they distinguished?
15. What is the place of a pronoun object when it is governed by a verb in the infinitive?

SECOND CLASS, CADET-ENGINEERS.

DESCRIPTIVE GEOMETRY.

MAY, 1873.—*Time allowed, five hours.*

1. Find the shortest line which can be drawn terminating in two right lines not in the same plane.

2. Find the intersection of two surfaces of revolution whose axes are in the same plane, and draw a tangent to the curve.

3. Find the intersection of a cone and hemisphere, and draw a tangent to the curve of intersection. Develop the cone and curve.

4. Pass a plane through a given right line tangent to a given sphere, using a circumscribing cylinder.

5. Given a niche; find the shadow on the interior surface.

6. Find the perspective and shade and shadow of a groined arch; point of sight taken to the left of the middle vertical line of the drawing.

N. B.—Full explanation and analysis to be given.

SECOND CLASS, CADET-ENGINEERS.

STEAM-ENGINERY.

MAY 21, 1873.—*Time allowed, five hours.*

1. Demonstrate the increased efficiency of steam of 40 pounds per square inch (absolute) over that of 25 pounds per square inch, (absolute,) and give the theoretical gain per cent.; relative volumes, 679 and 1044, respectively.

2. Find initial pressure of steam cut off at $\frac{1}{4}$ and $\frac{1}{8}$ stroke, to do the same work as steam of 30 pounds per square inch per gauge, following full stroke.

3. Total heat, 1200.56°; temperature, 284°; feed, 110°; sea-water, $\frac{1}{32}$. Required, *loss by blowing off*, the water in the boiler being $\frac{2}{32}$.

4. Temperature, 284°; feed, 105°; sea-water, $\frac{1}{32}$; water in boiler, $\frac{1\frac{7}{8}}{32}$. Required the gain from using feed of 125°.

5. Cylinder, 36 inches diameter; stroke, 3 feet; revolutions, 65 per minute; *loss by blowing off*, 10 per cent.; coal per hour, 2,100 pounds; relative volume, 1,044; terminal pressure, 25 pounds per square inch, (absolute.) Required the number of pounds of water evaporated per pound of coal.

6. Required the bursting pressure of a cylindrical boiler 5 feet diameter and $\frac{3}{8}$ inch thick; the seams double-riveted; tensile strength of plate, 60,000 pounds per square inch.

7. What is the horse-power of an engine 54 inches diameter of cylinder, 4-foot stroke, using steam of 30 pounds per gauge, and cutting off at half stroke; revolutions, 50; vacuum, 27 inches; and barometer, 30 inches?

8. Area of piston, 1,000 square inches; stroke, 3 feet; revolutions, 65 per minute; speed of steam, 100 feet per second; valve, single ported; and length of port, 36 inches: required the width of port.

9. Show on a "card" the effect of an eccentric having slipped back.

10. Sketch all the valves you are familiar with, stating to what kind of engines they are usually applied.

11. Sketch all the types of engines you are familiar with, and point out their peculiarities.

12. Sketch all the gauges you know, and explain their action.

13. Sketch all the methods of condenser-tube packing you are familiar with.

14. Name all the *cut-offs* that you are familiar with, and state how they cut off steam

15. Sketch two "cards" cutting off at $\frac{1}{3}$ and at $\frac{1}{4}$ stroke, for condensing and non-condensing engines, respectively.

16. Sketch a vertical and a horizontal tubular boiler, and explain their differences. Which can be made to burn the most coal per square foot of grate surface?

17. A vessel burns 40 tons of coal per day, steaming at the rate of 10 knots per hour. What distance can she make *good* against a four-knot current with 400 tons of coal, running at the most economical speed?

18. With the following data construct, from a Zeüner's diagram, an indicator card: lead-angle, 3°; half travel of the valve, $2\frac{1}{2}$ inches; steam-lap, $1\frac{1}{2}$ inches; exhaust-lap, $\frac{3}{4}$ inch; and point of cut-off, $\frac{5}{8}$ of the stroke from beginning.

19. Steam cut off at $\frac{5}{16}$ of the stroke: what would be the formula for the mean pressure?

20. Speed of ship, 10 knots; revolutions of screw, 60 per minute; and slip, 20 per cent. Required the pitch.

FIRST CLASS, CADET-ENGINEERS.

STEAM-ENGINERY.

MAY 22, 1873.—*Time allowed, five hours.*

1. Demonstrate the increase of efficiency of steam of 80 pounds per square inch over that of fifty pounds; also give the theoretical gain per cent. of fuel. Temperature of 80 pounds = 315°.8, and volume = 362; temperature of 50 pounds pressure = 283°.2, and volume = 554; temperature of feed-water = 100°.

2. Find initial pressure of steam cut off at $\frac{1}{4}$ and $\frac{1}{3}$ stroke, to do the work corresponding to steam of 40 pounds per square inch, following full stroke.

3. Temperature of water in boiler, 284°; feed-water, 120°; and density of sea-water, $\frac{\frac{3}{4}}{32}$. Required the loss by blowing off, maintaining water in boiler at density of $\frac{2}{32}$.

4. Cylinder, 36 inches diameter; stroke, 3 feet; revolutions, 65 per minute; sea-water density, $\frac{\frac{3}{4}}{32}$, and water in boiler maintained at $\frac{2}{32}$; feed-water temperature, 120°; coal per hour, 2,000 pounds; clearance in cylinder = 2 inches of the stroke; and the relative volume, 1,281; terminal pressure, 20 pounds per square inch, absolute: required the number of pounds of water evaporated per pound of coal.

5. Propeller, 12 feet diameter, and pitch, 20 feet; piston area, 1,018 square inches; pressure (absolute,) 45 pounds per square inch; stroke, 3 feet; revolutions 60 of propeller and engine. Required the strain upon each of the three blades of the propeller. (Area of hub neglected.)

6. Depth of beam of an engine, 42 inches; diameter of cylinder, 75 inches; stroke of piston, 7 feet; pressure, 20 pounds per square inch per gauge. Required the depth of a beam for an engine of 80 inches diameter of cylinder, and 8 feet stroke, the pressure being 15 pounds per square inch per gauge.

7. Working pressure, 80 pounds per square inch per gauge; double butt-strapped and double-riveted; diameter of the boiler, 7 feet. Required the thickness, using your own judgment as to the factor of safety.

8. Required, the thickness of a flue 3 feet diameter, and 12 feet long, for the above boiler. How would you double the strength of this flue?

9. What is the horse-power of an engine, 36 inches diameter of cylinder; stroke, 3 feet; pressure, 30 pounds per square inch per gauge; vacuum, 26 inches; cut-off, one-half stroke; revolutions, 60 per minute; clearance and nozzles, 2 inches length of stroke?

10. Sketch such valves in general use as you are familiar with, and describe their peculiarities.

11. Sketch the different types of engines with which you are acquainted, and point out advantages and disadvantages.

12. Name all the cut-offs you are acquainted with, and describe their prominent features. To which type of engine is each generally attached?

13. Name the various gauges in common use, and explain the action of each.

14. An engine has been cutting off at half stroke; show what effect will be produced on the indicator-card by the slipping ahead of the eccentric 45°.

15. A ship with 400 tons of coal burns 40 tons per day, at the rate of 10 knots; but steams 46.3 days against a current at the most economical rate of speed. Required the speed, in knots per hour, made good.

FIRST CLASS CADET-ENGINEERS.

STEAM-ENGINERY.

MAY 26, 1873.—*Time allowed, four hours.*

1. Give formula for the indicated horse-power for any ship, by the immersed midship section; by the displacement, and by the augmented surface.

2. Give coefficient of augmentation from the following data: mean of square of sines, .0674, and of the 4th power of the sines .00583. What is the augmented surface?

3. Calculate the probable speed of a ship from the following data: Mean immersed girth, 76.3 feet; length, 380 feet; coefficient of augmentation as in example 2; indicated horse-power, 5,471, and coefficient of propulsion, 20,000.

4. Calculate indicated horse-power of a ship, using for the purpose the data of examples 2 and 3, for a speed of 14,356 knots. Cube of 14.356 = 2,959.

5. What is the diameter of cylinder to give the indicated horse-power as in example 3, (5,471.) Initial absolute pressure, 50 pounds; cut-off, 23 inches from beginning of stroke; stroke, 4 feet; revolutions, 65 per minute; mean back pressure per square inch, 4 pounds; double engine; clearance, 2 inches.

6. What should be the thickness of the above-mentioned cylinder?

7. Diameter of cylinder as found in example 5; stroke, 4 feet; revolutions, 65 per minute; speed of steam through port, 100 feet per second; valve, double-ported; length of port equal to diameter of cylinder: required the width of one port.

8. Calculate the condensing surface for engines of example 5. Relative volume of steam and water at 50 pounds pressure = 544.

9. Required the size of circulating pump for engines of example 5, filling ¾ at each stroke; pump to be double-acting; temperature of steam, 284°; injected water, 65°; discharge-water, 115°, and hot well 120°.

10. Draw compound-engine indicator diagrams and explain them, for continuous expansion, and for receiver, the cranks being at 90°.

REGULATIONS

FOR THE

APPOINTMENT OF CADET-ENGINEERS IN THE NAVY.

I. In pursuance of the third and fourth sections of an act passed at the first session of the Thirty-eighth Congress, approved July 4, 1864, "*To authorize the Secretary of the Navy to provide for the education of naval constructors and engineers, and for other purposes,*" and of the second section of an act passed at the first session of the Thirty-ninth Congress, approved March 2, 1867, entitled "*An act to amend certain acts in relation to the Navy,*" applications will be received by the Navy Department for the appointment of cadet-engineers.

II. The application is to be addressed to the Secretary of the Navy, and can be made by the candidate, or by any person for him, and his name will be placed on the register. The registry of a name, however, gives no assurance of an appointment, and no preference will be given in the selection to priority of application.

III. The number of cadet-engineers is limited by law to fifty. The candidate must not be less than seventeen nor more than twenty-one years of age; he will be required to certify, *on honor*, to his precise age, to the Academic Board, previous to his examination, and no one will be examined who is over or under the prescribed age. His application must be accompanied by satisfactory evidence of moral character and health, with information regarding date of birth and educational advantages hitherto enjoyed. Candidates who receive permission will present themselves to the Superintendent of the Naval Academy between the 15th and 25th of September, for examination as to their qualifications for admission.

IV. The course of study will comprise two academic years. All cadets who graduate will be warranted as assistant engineers in the Navy. The pay of a cadet-engineer is the same as that of a cadet-midshipman.

V. The academic examination previous to appointment will be on the following subjects, namely: *Arithmetic:* the candidate will be examined in numeration and the addition, subtraction, multiplication, and division of whole numbers, and of vulgar and decimal fractions; in reduction; in proportion or rule of three, direct and inverse; extraction of square and cube roots; in *Algebra,* (Bourdon's,) through equations of the first degree; in *Geometry,* (Davies's Legendre,) through the plane figures; *Rudimentary natural philosophy; Reading;* he must read clearly and intelligibly from any English narrative work, as, for example, Bancroft's History of the United States; in *writing* and *spelling;* he must write from dictation, in a legible hand, and spell with correctness, both orally and in writing; in English *grammar* and English *composition* he will be examined as to the parts of speech, the rules connected therewith, and the elementary construction of sentences, and will be required to write such original paragraphs as will show that he has a proper knowledge of the subject. The candidate will also be required to exhibit a fair degree of proficiency in pencil-sketching, and to produce satisfactory evidence of mechanical aptitude. Candidates who possess greatest skill and experience in the practical knowledge of machinery, other qualifications being equal, shall have precedence for admission.

VI. Any of the following conditions will be sufficient to reject a candidate:

Feeble constitution, permanently impaired general health, decided cachexia, all chronic diseases or results of injuries that would permanently impair efficiency, viz:

1. Infectious disorders.

2. Weak or disordered intellect.
3. Unnatural curvature of spine.
4. Epilepsy, or other convulsions within five years.
5. Chronic impaired vision, or chronic disease of the organs of vision.
6. Great permanent hardness of hearing, or chronic disease of the ears.
7. Loss or decay of teeth to such an extent as to interfere with digestion and impair health.
8. Impediment of speech to such an extent as to impair efficiency in the performance of duty.
9. Decided indications of liability to pulmonary disease.
10. Permanent inefficiency of either of the extremities.
11. Hernia.
12. Incurable sarcocele, hydrocele, fistula, stricture, or hemorrhoids.
13. Large varicose veins of lower limbs. Chronic ulcers.
14. Attention will also be paid to the stature of the candidate, and no one *manifestly* under-sized for his age will be received into the Academy. In case of doubt about the physical condition of the candidate, any marked deviation from the usual standard of height will add materially to the consideration for rejection.
15. The board will exercise a proper discretion in the application of the above conditions to each case, rejecting no candidate who is likely to be efficient in the service, and admitting no one who is likely to prove physically inefficient.

VII. If both these examinations result favorably, the candidate will receive an appointment as a cadet-engineer, become an inmate of the Academy, and will be allowed his actual and necessary traveling expenses from his residence to the Naval Academy, and be required to sign articles by which he will bind himself to serve in the United States Navy six years, (including his term of probation at the Naval Academy,) unless sooner discharged. If, on the contrary, he shall not pass both of these examinations, he will receive neither an appointment nor his traveling expenses, nor can he have the privilege of another examination for admission *to the same class* unless recommended by the board of examiners.

VIII. When candidates shall have passed the required examinations and been admitted as members of the Academy, they must immediately furnish themselves with the following articles, viz:

One navy-blue uniform suit	$39 16
One fatigue suit	13 67
One navy-blue uniform cap	4 46
One uniform overcoat	23 55
Six white shirts	11 28
Six pairs of socks	1 56
Four pairs of drawers	3 12
Six pocket-handkerchiefs	2 28
One hair mattress	10 71
One pillow	1 58
One pair of blankets	4 25
One bed-cover or spread	1 30
Two pairs of sheets	3 52
Four pillow-cases	1 20
Six towels	1 38
Two pairs of shoes or boots	6 25
One hair-brush	1 00
One tooth-brush	31
One clothes-brush	31
One coarse comb for the hair	45
One fine comb for the hair	31
One tumbler or mug	13

One fatigue-cap	$1 50
One straw mattress	1 58
One requisition-book	50
One laundry-book	50
One pass-book	50
Total	149 77

Room-mates will jointly procure, for their common use, one looking-glass, one wash-basin, one water-pail, one slop-bucket, and one broom. These articles may be obtained from the store-keeper of the Academy, of good quality, and at fair prices.

IX. Each cadet-engineer must, on admission, deposit with the paymaster the sum of $75, for which he will be credited on the books of that officer, to be expended, by direction of the Superintendent, for the purchase of text-books and other authorized articles besides those enumerated in the preceding article.

X. While at the Academy the cadets will be examined, from time to time, according to the regulations prescribed by the Navy Department; and if found deficient at any examination, or dismissed for misconduct, they cannot, by law, be continued in the Academy, or naval service, except upon recommendation of the Academic Board.

XI. A cadet-engineer who voluntarily resigns his appointment will be required to refund the amount paid him for traveling expenses.

GEO. M. ROBESON,
Secretary of the Navy.

NAVY DEPARTMENT, *April* 4, 1871.

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